

STATE OF VERMONT
PUBLIC SERVICE BOARD

Docket No. 7373

Joint Petition of Vermont Electric Power Company, Inc.,)	
Vermont Transco, LLC, and Central Vermont Public)	Technical Hearings at
Service Corporation for a certificate of public good,)	Montpelier, Vermont
pursuant to 30 V.S.A. Section 248, authorizing the)	October 29 and November 6,
construction of the Southern Loop Transmission)	2008
Upgrade Project)	

Order entered: 2/11/2009

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I. INTRODUCTION

A. Summary

Vermont Electric Power Company, Inc. and Vermont Transco LLC (collectively, "VELCO"), and Central Vermont Public Service Corporation ("CVPS," and together with VELCO, "Petitioners") filed a petition, pursuant to Section 248 of Title 30, for a certificate of public good ("CPG") to construct the Southern Loop Transmission Upgrade Project (the "Southern Loop Project" or "Project"). The Project involves the construction of a second 345 kV transmission line between Vernon, Vermont, and VELCO's Coolidge Substation in Cavendish, Vermont, together with a new substation at Vernon and an expansion of the Coolidge Substation (collectively, these components comprise the "Coolidge Connector"). In addition, to address existing local reliability problems on the CVPS system, the Project includes a new Newfane

345/115/46 kV substation and an approximately one-mile 345 kV loop into the new Newfane substation from the new 345 kV Vernon-to-Cavendish line.

In today's Order, we conclude that the Southern Loop Project is essential to address regional and local reliability problems that are both significant and pressing. We further conclude that the need for the Project cannot be replaced or deferred by alternatives, including demand-side management measures, local generation, and smart-grid technologies.

Two major regional reliability concerns affecting Vermont involve the loss of the existing Vernon-to-Cavendish 345 kV line and the loss of the Vermont Yankee Nuclear Station ("Vermont Yankee") 345/115 kV transformer located at the southern end of the Vernon-to-Cavendish 345 kV line. The existing Vernon-to-Cavendish 345 kV line carries a substantial proportion of Vermont's load – at times, almost half of Vermont's load – and serves critical energy transfers within New England and into and out of New York. If this line is lost at current summer peak demand levels, numerous 115 kV lines can be overloaded in multiple states, potentially resulting in voltage collapse and exposing Vermont to a blackout that could affect 1000 MW of load in Vermont (i.e., almost the entire state), as well as significant load in neighboring states. The proposed Project would address this regional reliability problem by providing facilities that create a second 345 kV path from Vernon to Cavendish.

The second regional reliability problem would arise if the Vermont Yankee 345/115 kV transformer located at the Vermont Yankee substation in Vernon is lost. This transformer connects the New England 345 kV network to the local 115 kV system, which in turn supplies load in southeastern Vermont (Brattleboro and surrounding areas) and southwestern New Hampshire. Loss of this transformer places all local loads in southeastern Vermont and southwestern New Hampshire on: (1) the 115 kV network supplied solely out of the Public Service Company of New Hampshire ("PSNH") network in New Hampshire; and (2) CVPS's 46 kV network supplied remotely from Bennington. Outages on these remaining local transmission and local subtransmission facilities would lead to loss of local load until the lost facilities are restored. In these circumstances, 30 to 50 MW of CVPS load in southeastern Vermont and 150 to 200 MW of load in southwestern New Hampshire could be lost. The proposed Project would address this regional reliability problem through the installation of a

second 345/115 kV autotransformer in a new substation to be constructed in Vernon, removing the reliability susceptibility for loss of the sole Vermont Yankee 345/115 kV autotransformer.

In addition to these regional reliability problems, there are significant local reliability problems in southern Vermont. Electrical facilities owned by CVPS have limited ability to support increased electrical demand and are unable to withstand failures of, or to have preventive maintenance conducted on, key components at present demand levels. This reliability problem stretches from southwestern to southeastern Vermont, potentially affecting 40,000 customers, and is present for more than half of the hours in the year. The proposed Project would address this local reliability concern by including a new injection point (the new Newfane 345/115/46 kV Substation and one-mile 345 kV loop line between the Newfane Substation and the Vernon-to-Coolidge 345 kV line). This new injection point complements other ongoing CVPS efforts in southern Vermont, including geographically-targeted energy efficiency in the Southern Loop area.

We have carefully considered a wide range of possible alternatives, both traditional transmission upgrades and non-transmission alternatives, to address these local and regional reliability problems. Among traditional transmission solutions, the proposed Project is the clearly superior option, because it is the lowest-cost transmission alternative that effectively resolves the reliability concerns.

Non-transmission alternatives, including demand-side management measures, local generation, and smart-grid technologies, cannot resolve the regional and local reliability problems that confront VELCO and CVPS. As we explain further in our Order below, these possible alternatives suffer from various deficiencies, ranging from an inability to resolve effectively the fundamental reliability issues, to excessive costs compared to the proposed Project, to significant barriers that preclude timely implementation.

We recognize that load growth in Vermont has been held in check in recent years in large part due to energy efficiency efforts. We also recognize that electric loads will likely be lower over the near term, due to the current economic downturn. These factors have led some public commenters to call for a delay in approving the Southern Loop Project, to provide an opportunity to develop alternatives to the Project that focus on energy efficiency, local generation, and smart-

grid technologies. However, close inspection has revealed that there are no alternative solutions that would be sufficient to avoid or defer the need for the Project for the fundamental reason that the load threshold for the needed upgrades was exceeded years ago.

As noted later in this Order, the proposed Project does incorporate plans for energy efficiency and customer-sited distributed generation in order to defer a potential additional 115 kV Project component. However, the remainder of the Project cannot be deferred by non-transmission alternatives, and is the most cost-effective solution among potentially available transmission alternatives to solve the severe reliability exposures faced by both the regional and local system networks. Without the Project, the Vermont transmission system fails to comply with applicable federal and regional reliability standards. To do nothing or to select a less effective solution would saddle Vermont, its residents and its businesses with a less reliable electric network than would be achieved with the Project.

In addition to improving the reliability of the Vermont transmission system, the stronger, more stable transmission system resulting from the Project will provide a more robust framework for local generation, and provide this area access to generation from elsewhere in Vermont and New England. This will reduce congestion that results from existing operational reliability constraints and improve efficiency by reducing system losses. The added transmission strength afforded by the Project will result in added stability and power-quality benefits, particularly through redundancy of the added 345 kV line from Vernon to Coolidge.

The Petitioners have presented final design detail plans, have completed or nearly completed all critical environmental review and permit applications, and have engaged in both an extensive public outreach process and collaborative efforts with other parties, including local communities and the affected permitting agencies. We recognize and appreciate these efforts undertaken on behalf of all of the parties, and believe that they have been instrumental in producing an efficient process and positive result.

The proposed Project, as conditioned by this Order, will ensure electric reliability for the area and will not result in undue adverse impacts under any of the substantive criteria of 30 V.S.A. § 248(b). Consequently, we find that the Project is in the general good of the state and its residents and approve the Project, as conditioned below.

B. Procedural History

On November 8, 2007, VELCO and CVPS filed a joint petition seeking a CPG authorizing the Southern Loop Project. In advance of filing the petition, VELCO and CVPS conducted an extensive public outreach effort over a two-year period. VELCO, CVPS and a group of public stakeholder representatives¹ collaborated in an intensive effort to assess and identify potential solutions to solve the serious reliability problems affecting the southern Vermont and regional systems. The stakeholders in the public outreach process reached a consensus that the companies should build the proposed Project and infrastructure in a manner that will maximize future opportunities for distributed resources in Vermont. In addition, the Petitioners met with Selectboards and/or Planning Commissions, as well as individual landowners, from each of the thirteen involved communities.²

The Board held a prehearing conference on December 19, 2007. Appearances were entered by: Kimberly K. Hayden, Esq., of Downs Rachlin Martin PLLC for VELCO; Morris L. Silver, Esq., for CVPS; James Porter, Esq., and Laura Scanlan Beliveau, Esq., for the Vermont Department of Public Service; David C. Englander, Esq., for the Agency of Natural Resources; Sandra E. Levine, Esq., for the Conservation Law Foundation; James Matteau for the Windham Regional Commission; David Ryan for the Dummerston Planning Commission; George T. McNaughton, Esq., for Carl Ferenbach, III and Judy W. Ferenbach; and Dennis L. Shaffer for the Vermont Land Trust.

The Board granted the following parties' requests to intervene in the Docket: Carl Ferenbach, III and Judy W. Ferenbach (the "Ferenbachs"); the Conservation Law Foundation ("CLF"); the Windham Regional Commission ("WRC"); the Town of Brookline; the Town of Dummerston; the Town of Newfane; the Town of Townshend; the Town of Brattleboro; the Town of Cavendish; the Vermont Public Power Supply Authority ("VPPSA"); ISO New

1. Among the invited stakeholders were representatives of local and regional governmental authorities, environmental advocacy groups, emergency-preparedness and response organizations, large and small electricity users, energy advocacy groups including energy efficiency and renewables supporters, and other civic and community-based organizations.

2. See K. Johnson pf., generally; *see also* LaForest pf. at 10–11; Jones/Kirby pf. at 17–19; exh. Petitioners KJ-II.

England, Inc. ("ISO-NE"); and the Vermont Land Trust ("VLT"). The Board denied the motion of Northeast Utilities Service Company ("NUSCO") to intervene.

In its February 8, 2008, Order on Motions to Intervene, the Board granted ISO-NE's request to admit pro hac vice Anthony M. McLeod, Esq. The Board later granted ANR's motion for the admission pro hac vice of Michael Steeves, Esq., on May 16, 2008.

The following parties either withdrew from or suspended their participation in the Docket prior to the technical hearings: the Ferenbachs; VLT; the Vermont Division for Historic Preservation; the Town of Brookline; and the Town of Brattleboro.

A public hearing was held on January 17, 2008. At the public hearing 18 members of the public spoke. Over the course of this proceeding, the Board also received dozens of written public comments.³

A site visit was conducted on May 22, 2008.

Technical hearings were held on October 29, 2008, and November 6, 2008. Prefiled testimony and exhibits filed by the following parties were admitted into the record: the Petitioners; DPS; ISO-NE; ANR; and the Town of Dummerston.

The Petitioners entered into a number of settlements and stipulations with parties to this proceeding, including ANR, DPS, the Town of Dummerston (with respect to the prefiled testimony of Kurt Yeager), the Ferenbachs, and VLT. These stipulations were each admitted into the record as exhibits. *See* Exhibits Stipulation 1–5, 5A.

At the technical hearings, the Board made record requests of the Petitioners. CVPS and VELCO filed responses to the record requests on, respectively, November 6 and December 16, 2008.⁴

On December 3, 2008, the Petitioners, the DPS and ANR jointly filed a brief in support of the Project. Also on December 3, ISO-NE filed a brief in support of the project. No other party filed a brief.

3. The issues raised by the public commenters are described in Section III of this Order, below.

4. The Board established a deadline for objections to the admission of the responses into the evidentiary record. No objections were filed and, therefore, CVPS's November 6 response and VELCO's December 16 response are admitted into the evidentiary record.

II. FINDINGS AND DISCUSSION

A. Project Description

(1) General

1. The Project includes a new 51-mile 345 kV transmission line from Vernon to Cavendish ("360 Line"), a new 345/115 kV substation in Vernon ("Vernon Substation"), a new 345/115/46 kV substation in Newfane ("Newfane Substation"), two new 345 kV lines extending for approximately one mile from the 360 Line in Dummerston to the Newfane Substation (the "Newfane Loop") and an expansion of the existing substation in Coolidge. LaForest pf. at 17-21.

2. The proposed 360 Line will involve the construction of a second Vernon-to-Cavendish 345 kV transmission line located within VELCO's existing transmission right-of-way that extends from VELCO's Coolidge Substation in Cavendish south to a proposed Vernon Substation to be located north of the existing Vermont Yankee substation in Vernon, Vermont. The 360 Line will pass through thirteen towns: Vernon, Guilford, Brattleboro, Dummerston, Newfane, Brookline, Townshend, Grafton, Windham, Andover, Chester, Ludlow and Cavendish, Vermont. The 360 Line will be located west of and parallel to VELCO's existing 345 kV Vernon-to-Cavendish transmission line ("340 Line"). The configuration of the 360 Line will match the 340 Line to the extent possible. Most of the 360 Line, with the exception of the first approximately one-mile segment out of the Vernon Substation, will utilize wood H-frame structures similar to the existing line. Single-pole steel structures will be utilized along the first approximately one-mile segment, matching the existing single steel poles in that location. LaForest pf. at 17-18.

3. The Vernon Substation is proposed to be constructed on a 9-acre site to the north of the Vermont Yankee Nuclear Plant. The Vernon Substation will serve as the major switching facility for the area, interconnecting the existing Vermont Yankee transmission system and the Vermont transmission system including the existing 340 Line and the new 360 Line. Barrett pf. at 3; Roam supp. pf. at 4; exh. Petitioners Supp. RR-7 at 1; exh. Petitioners Supp. RR-10; exh. Petitioners Supp. RR-14.

4. The Petitioners plan to construct the Newfane Substation, a 345/115/46 kV substation with a three-breaker ring bus, on an 8-acre site in the Town of Newfane. The Newfane

Substation will connect, via the Newfane Loop, the 360 Line to the local CVPS 46 kV system. LaForest pf. at 19; Barrett pf. at 9-11.

5. The Newfane Loop will provide a dual-circuit connection between the 360 Line and the Newfane Substation. The Newfane Loop will consist of two new 345 kV lines (which will form a "loop") for approximately one mile from the 360 Line in Dummerston to the Newfane Substation. In order to accommodate the proposed structures for the Newfane Loop, VELCO will need to significantly expand the existing 150-foot wide right-of-way currently used by CVPS's 46 kV subtransmission line. This new loop will provide local reliability support to the CVPS 46 kV subtransmission loop by energizing the Newfane substation. LaForest pf. at 20; McNamara pf. at 11; exh. Petitioners Supp. RR-5.

6. In a separate, but related, project, CVPS is currently developing a synchronous condenser facility at a new substation being constructed in Winhall, Vermont (the "Kendall Farm substation"), that was approved by the Board in its Order dated March 28, 2008, in Docket No. 7246. The CVPS Southern Loop target area has also been the recipient of geographically-targeted energy efficiency services by Efficiency Vermont, and CVPS plans on continuing the acquisition of efficiency resources in this area, as well as the introduction of customer-sited distributed generation as a part of its plan for the provision of service to customers served by the CVPS Southern Loop 46 kV subtransmission system. Jones/Kirby pf. at 4, 24-26; exh. Petitioners KJ/LK-6 at 21.

7. VELCO's existing 6-acre Coolidge Substation site, located at Quent Phelan Road in Cavendish, will be expanded to connect the new 360 Line from Vernon. The existing 345 kV switchyard will be expanded into a three-bay breaker-and-one-half switching station, with associated breakers, switches and other equipment. Expansion of the existing substation yard (including fence expansion) is necessary to accommodate new equipment, modify the substation's design according to current bulk power system design standards, as well as to provide for a future T2 transformer as shown on the conceptual general arrangements. In addition, 115 kV station equipment is being replaced now to allow full use of the existing 345/115 kV Coolidge autotransformer's rating and remove undersized and outdated station equipment concurrent with this station upgrade. LaForest pf. at 20-22.

(2) The 360 Line

8. The route for the new 360 Line will run a total of approximately 51 miles from the proposed Vernon Substation to the existing Coolidge Substation in Cavendish, in the same corridor and parallel to the existing Vernon-to-Cavendish 345 kV line. McNamara pf. at 4-5.

9. In order to minimize aesthetic impact and provide a more uniform appearance, the new line will closely match the adjacent existing 340 Line in location and configuration. Similar to the 340 Line, the new 360 Line will also be a single-circuit, wood H-frame transmission line, except for the first approximately one-mile line segment, which will consist of single-circuit, single-pole steel structures. LaForest pf. at 18; McNamara pf. at 3-6.

10. The centerline of the new 360 Line will be offset to the west from the centerline of the existing 340 Line by 100', leaving 75' from the new centerline to the existing western edge of the overall 250-foot wide right-of-way. McNamara pf. at 5-6.

11. All of the H-frame wood tangent structures are direct-embedded wood poles with Corten steel crossarms. McNamara pf. at 6.

12. In Vernon, about one mile (nine structures) of the new line north of the proposed Vernon Substation will be constructed of new Corten steel single poles configured to match the existing steel poles; the existing steel poles will be repainted to match the new poles' Corten color. Temporary wood structures may be required to be installed in the area of the proposed Vernon Substation, to facilitate construction. McNamara pf. at 6-7; exh. Petitioners WM-6 (describes heights for these structures); exh. Petitioners Supp. RR-3.

13. The centerline of these new poles will be offset 50' west from the centerline of the existing 345 kV steel pole line, leaving 50' from the new centerline to the existing western edge of the overall 200-foot wide right-of-way in this section. McNamara pf. at 6.

14. These will feature three 15' to 18' davit arms extending from one side of the structure, carrying the bundled conductors in a vertical configuration, and one 18' davit arm carrying the shield wire (one 0.62" diameter Optical Fiber Ground Wire) matching the existing steel pole configuration. The empty davit arms on the west side of the existing steel poles will be removed.

The new steel poles with steel davit arms will be installed on concrete foundations similar to the current steel pole structures. McNamara pf. at 6-7.

15. The two poles of the tangent H-frame suspension structures will be spaced at 26 feet. McNamara pf. at 5.

16. Angles in the alignment (angle structures) will be made with wood three-pole structures, with the poles spaced from 29 to 37 feet apart. McNamara pf. at 5.

17. Three-pole, dead-end structures will also be used for statically attaching the conductors to the poles (rather than suspending them from clamps, as is done with all tangent and some angle structures). McNamara pf. at 5.

18. The dead-end structures provide protection against cascading failure of the line under heavy load conditions (e.g., heavy ice with wind). All of these wood three-pole dead-end structures are guyed (as are the wood three-pole angle structures, which may or may not also serve as dead-end structures). McNamara pf. at 5.

19. Following the filing of its prefiled direct testimony on November 8, 2007, VELCO determined that many dead-end structures had initially been proposed on the new 360 Line in unnecessary locations with respect to prevention of cascading line failures. As a result, VELCO submitted a revised design which included 40 fewer three-pole dead-end structures than were initially proposed. Reducing the number of dead-end structures results in fewer poles, guy wires, anchors, pole hardware and conductor splicing throughout the Southern Loop Project. Roam supp. pf. at 4; exh. Petitioners Supp. RR-1.

20. Typical steel pole and wood H-frame cross sections for this line are included as Exhibit Petitioners WM-4.

21. More than 75% of the new structures for the 360 Line will be kept within 10' of the height of the existing 340 Line structures. On average, the above-ground height of the new structures increased by about 3', from approximately 77' for the existing structures to about 80' for the new structures. McNamara pf. at 9; exh. Petitioners Supp. RR-3 at 9.

(3) Vernon Substation

22. VELCO proposes to build the new Vernon Substation in a vacant fenced-in lot located on Entergy's property, just to the north of the existing Vermont Yankee substation yard. Barrett pf. at 3; exh. Petitioners Supp. RR-10; exh. Petitioners Supp. RR-14.

23. The proposed Vernon Substation will consist of a new 345 kV substation, two 345/115 kV power transformers, and a new 115 kV substation. Barrett pf. at 4; exhs. Petitioners Supp. RR-10, Supp. RR-11, Supp. RR-13, Supp. RR-14 (detailed general arrangement, elevation drawings, one-line drawings, and preliminary site plan).

24. The 345 kV substation will be designed as a four-bay, breaker-and-one-half configuration bus, with four line positions, two transformer positions, one generator position, and one future position. It will initially contain eleven circuit breakers with associated structural steel, disconnect switches, bus work and auxiliary equipment. *Id.*

25. Space has been allocated for a future twelfth circuit breaker and third 345/115 kV power transformer. In addition, space in the yard has been reserved for two additional 345 kV bays. *Id.*

26. The 115 kV substation will be designed as a two-bay, breaker-and-one-half configuration bus, with two line positions and two transformer positions. Space in the yard has been reserved for two additional 115 kV bays. The 115 kV substation will initially contain six circuit breakers with associated structural steel, disconnect switches, bus work and auxiliary equipment. *Id.*

27. The existing capacitor banks will be relocated from the Vermont Yankee 115 kV switchyard to connect to the buses in the new Vernon substation. *Id.*

28. The substation perimeter fence size and substation footprint will be approximately 9 acres, reduced from the approximately 14 acres included with the initial filing. Roam supp. pf. at 4; exh. Petitioners Supp. RR-7 at 1.

29. A new control house will be installed to contain the protection and control equipment for the new substation. Barrett pf. at 5.

(4) Newfane Substation

30. The Newfane Substation will provide a connection from the 360 Line to the local CVPS 46 kV subtransmission system. The Newfane Substation and the Newfane Loop are intended to reinforce the local 46 kV system, which is expected to improve the system's ability to address existing local reliability issues in southern Vermont. LaForest pf. at 19; Barrett pf. at 9-11.

31. Petitioners initially considered locating this new substation in the Town of Dummerston. However, following an extensive public outreach effort and strong public and local community concerns expressed about the Dummerston location, Petitioners modified their proposal to construct a new substation in the Town of Newfane. K. Johnson pf. at 17.

32. The Newfane Substation will consist of a new 345 kV substation, a new 345/115 kV power transformer, a new 115 kV substation, and a new 115/46 kV power transformer. Exhs. Petitioners MB-7 (aerial photograph of the location with the substation site plan overlaid), MB-10, Supp. RR-15, Supp. RR-16, Supp. RR-17 and Supp. RR-18 (detailed general arrangement, elevation drawings, one-line drawings, and grading plans).

33. The 345 kV substation will be designed as a four-position ring bus, with two line positions and two transformer positions. Initially, two line positions and one transformer position will be constructed. The 345 kV substation will initially contain three circuit breakers with associated structural steel, disconnect switches, bus work and auxiliary equipment. Space has been allocated for a future fourth circuit breaker and 345/115 kV power transformer. Initially, a small portion of this substation will be constructed to provide a path from the secondary of the 345/115 kV power transformer to the primary of the 115/46 kV power transformer. Barrett pf. at 9-10.

34. The 115 kV substation will initially contain one 115 kV circuit breaker with associated structural steel, disconnect switches, bus work and auxiliary equipment. The 115 kV substation will be designed as a four-position ring bus. Space has been allocated for two future 115 kV positions, including three future 115 kV circuit breakers and associated structural steel, disconnect switches, bus work and auxiliary equipment. Barrett pf. at 10.

35. The substation yard will be approximately 8 acres, and will be surrounded by a chain-link fence. Barrett pf. at 10.

36. A new control house will be installed to contain the protection and control equipment for the new substation, which is to include both VELCO and CVPS facilities. Barrett pf. at 10; exh. Petitioners Supp. RR-7 at 4.

(5) Newfane Loop

37. The Newfane Loop route runs approximately 1 mile from the existing 345 kV corridor in Dummerston to the proposed Newfane Substation. The Newfane Loop will run from the 360 Line into and out of the Newfane Substation (a total of approximately two miles of 345 kV line) and will provide flexibility for the 345 kV system by allowing portions of it to be isolated for planned operational and maintenance purposes, providing operational flexibility for both VELCO and CVPS. McNamara pf. at 11; LaForest pf. at 19.

38. A total of six design alternatives were developed and analyzed as alternatives to the original 345 kV vertical double-circuit steel tower design, leaving the existing CVPS 46 kV line in place to its south. The alternatives evaluated included the following:

- Undergrounding of the CVPS 46 kV line with side-by-side (i.e., single circuit) wooden H-frames;
- An underbuild of the CVPS 46 kV line on a horizontal wooden cross arm with side-by-side wooden H-frames;
- An underbuild of the CVPS 46 kV line using compact (Hendrix style) construction with side-by-side H-frames;
- Vertical double-circuit laminated wood structures, leaving the CVPS 46 kV line in place to the south;
- Shifting the construction of the vertical double-circuit steel tower structures to the southern side of the existing CVPS 46 kV line, to analyze opportunities to take advantage of varying topography; and
- Side-by-side single-circuit wood H-frame option, leaving the existing CVPS 46 kV line in place to its south.

Exh. Petitioners Supp. RR-1 at 2-3; exh. Stipulation 5 at 4-5.

39. The side-by-side single circuit wood H-frame option, leaving the existing CVPS 46 kV line in place to its south, is an optimal design based upon aesthetics and costs. Exh. Stipulation 5 at 4-5.

40. The use of side-by-side wood H-frames is similar to what is proposed for the main 340/360 Line right-of-way. *Id.*

41. The current design calls for nine sets of these side-by-side wood H-frame structures. McNamara pf. at 11; exh. Petitioners Supp. RR-1 at 3; exh. Petitioners Supp. RR-3.

42. The Newfane Loop will run parallel with the existing CVPS 46 kV line; the existing CVPS line is located in a 150' wide right-of-way, which is maintained by CVPS generally as a 100' wide cleared corridor. McNamara pf. at 11.

43. For the portion of the Newfane Loop entering the proposed Newfane Substation, in order to best span the West River and the field between it and River Road, and to correctly align the lines entering the substation, a slight alignment change at the structure just east of the West River is proposed, which would require a gradually wider right-of-way, from 335' to 443' through the field to the proposed substation. As the field is mostly cleared already, this should not result in significant extra clearing. McNamara pf. at 11-12; exh. Petitioners Supp. RR-5.

44. The centerline of the new Loop alignment will be offset to the north from the centerline of the existing 46 kV line by 78' and then 100', leaving 75' from the new Loop centerline to the new northern edge of the overall 210-foot-wide right-of-way. McNamara pf. at 12; exh. Petitioners Supp. RR-5.

(6) Expansion of the Coolidge Substation

45. The existing Coolidge Substation will be expanded to include a three-bay 345 kV substation with a breaker-and-one-half configuration, a six-position 115 kV ring bus, and four 115 kV capacitor banks. Barrett pf. at 14.

46. The location of the site is depicted on Exhibit Petitioners MB-12, which is an aerial photograph of the premises with the substation site plan overlaid. Barrett pf. at 14; exhs. Petitioners Supp. RR-19, Supp. RR-20, Supp. RR-21, Supp. RR-22, Supp. RR-23 (detailed general arrangement drawings, one-line drawings, and grading plans).

47. The existing 345 kV switchyard will be expanded into a three-bay breaker-and-one-half configuration. Barrett pf. at 14.

48. The north bus will be relocated approximately 30 feet to the north and the north fence will be relocated approximately 10 feet to the north. In addition, the west fence will be relocated approximately 10 feet to the west to provide sufficient space for the new equipment. Barrett pf. at 14-15; exh. Petitioners MB-12.

49. A total of five new 345 kV circuit breakers with associated structural steel, disconnect switches, bus work and auxiliary equipment will be installed. Barrett pf. at 15.

50. The expanded Coolidge Substation will terminate three 345 kV lines, being the existing 340 Line, existing line no. 350 (345 kV Coolidge to West Rutland), and the proposed 360 Line, and will include two power transformers (one existing and one future). Barrett pf. at 15.

51. The 115 kV substation will be expanded approximately 55 feet to the east to provide space for two new 115 kV capacitor banks with associated circuit breakers, disconnects and bus work. Barrett pf. at 15; exh. Petitioners MB-12.

52. In addition, all six of the existing 115 kV circuit breakers, along with their associated disconnect switches and taps, will be replaced. The existing thermal ratings of these devices are not adequate for the 115 kV power flows under certain contingencies. The existing 115 kV circuit breakers and associated equipment will be replaced with new 3000 Amp units. The live parts on the existing 115 kV disconnects will be upgraded to 3000 Amp units. Barrett pf. at 15; exh. Petitioners Supp. RR-7 at 4.

53. Finally, a portion of the 115 kV switchyard will be expanded approximately 130 feet to the north to accommodate a future 345/115 kV power transformer. Barrett pf. at 15.

54. The existing control house is large enough to accommodate the protection and control equipment associated with the expanded substation. Barrett pf. at 15.

55. Further analysis at the Coolidge Substation identified that the existing concrete drilled piers in the 115 kV yard have experienced significant frost action causing extensive deformation and movement of the bus work and equipment. Accordingly, it is necessary to replace the affected drilled piers as part of the proposed Project. Exh. Petitioners Supp. RR-7 at 4.

56. Due to the location of the work needed and proximity to energized equipment, the 115 kV switchyard will need to be de-energized to the extent possible to complete this work. Exh. Petitioners Supp. RR-7 at 4.

57. The proposed solution is to build a temporary bypass of the 115 kV switchyard interior to the proposed fence limits on the north side of the yard, which will include two temporary circuit breakers and associated equipment as well as a temporary strain bus to complete the circuit from the existing 345 kV/115 kV transformer to the temporary breakers protecting the K31 and K32 lines. Exh. Petitioners Supp. RR-7 at 4-5.

58. A temporary work-around at the Coolidge Substation of the existing 345 kV Coolidge to West Rutland line will be required to complete the installation of the new north bus and re-located disconnect for this line. Exh. Petitioners Supp. RR-7 at 5.

59. All temporary support structure and equipment with the exception of structure 403 on the existing 340 Line will be within the proposed fence limits and will be removed at the completion of the Project. Exh. Petitioners Supp. RR-7 at 5.

B. Project Cost and Regional Cost Recovery

(1) Project Cost Estimate

60. The total cost of the Project is estimated at \$264,813,321. The total cost estimate is comprised of \$114,544,449 of Direct Costs, \$51,269,359 of Indirect Costs, \$32,056,099 in Escalation, \$22,807,861 in Capital Interest, and \$44,135,553 in Contingency. Roam pf. at 8; exh. Petitioners RR-2.

61. In developing the cost estimate, VELCO identified the resources required to plan, design, and construct each of the five Project elements. The cost estimate was developed utilizing seven resource categories to establish the total cost for each Project element: (1) Material; (2) Labor; (3) Equipment; (4) Indirects; (5) Escalation; (6) Capital Interest; and (7) Contingency. Roam pf. at 3.

62. The Direct Costs were developed utilizing cost data from VELCO projects recently completed or currently in progress. Specifically, cost data associated with VELCO's West Rutland to New Haven 345 kV line (the 370 Line) and the New Haven and Granite substations were utilized to develop the material, labor and equipment costs. Roam pf. at 3.

63. Portions of the Project for which VELCO did not have recent actual cost data from its prior projects were estimated by PLM Electric Power Engineering, Inc. ("PLM"), R.G.

Vanderweil Engineers LLP ("Vanderweil"), and Commonwealth Associates, Inc. utilizing cost data from other projects recently constructed in the New England area. Roam pf. at 3.

64. The detailed line items for each Project element were estimated by Federal Energy Regulatory Commission ("FERC") code. Developing the cost estimates by FERC code enhances VELCO's ability to track costs in a manner consistent with the reporting format of actual costs as required by FERC. In addition, escalation costs can be more accurately calculated by applying the Handy-Whitman cost index to the estimated costs by FERC code. Roam pf. at 4.

65. VELCO used a 20 percent contingency for its cost estimate, based upon guidance from the Association for the Advancement of Cost Engineering, as well as the Electric Power Research Institute. This is an appropriate contingency given where the Project stands with design and outstanding permits. Tr. 10/29/08 at 73-75 (Roam).

Discussion

In two recent VELCO transmission projects that we approved – the Northwest Vermont Reliability Project and the Lamoille County Project – each project's costs escalated substantially over time, approximately doubling compared to the cost estimates that had initially been presented to us. Subsequently, VELCO has revised its cost-estimation procedures such that its estimates should be more reliable than in the past. Nonetheless, we conclude that it is appropriate for us to track the estimated costs of the Southern Loop Project, and especially to require prompt notification if the expected costs increase substantially. Therefore, we have included a condition in our approval requiring the Petitioners to file quarterly statements of their latest cost estimates, as well as prompt notification if estimated overall Project costs increase by more than five percent compared to the most recent filed cost estimate.

(2) Regional Cost Recovery

66. Eligibility for Pool Transmission Facilities ("PTF") regionalized cost recovery depends upon whether the entire 51-mile line is built to solve the regional problem. VELCO anticipates that ISO-NE will treat most of the Southern Loop Project elements as PTF and approve regional funding to pay for the Project's costs. Present estimates suggest that 100% of the 345 kV line and

the Coolidge and Vernon Substation costs will be borne regionally, with approximately 37% of the Newfane Substation being eligible for regional cost recovery. The Newfane Substation Project elements not eligible include the stepdown transformer and associated equipment at the Newfane Substation. LaForest pf. at 23; Roam reb. pf. at 9; tr. 10/29/08 at 104-105 (LaForest).

67. Vermont will pay only its load ratio share of the regionalized Project costs. Presently, Vermont's load ratio share of regional costs is approximately 4.2%. Vermont's share of the total Project cost is over \$34 million. This includes Vermont's approximately \$10 million share of PTF costs as well as approximately \$24 million of CVPS costs for its share of the Newfane Substation. The remaining almost \$231 million of Project costs will be regionally supported. LaForest pf. at 23; Roam reb. pf. at 9.

C. Project Schedule

68. The estimated construction schedule is from the 3rd quarter of 2009 through the 1st quarter of 2011. LaForest pf. at 24.

69. A failure to achieve this schedule will likely have adverse impacts on local reliability and overall Project cost. LaForest pf. at 24-25; *see also* findings herein relating to Project Need and Project Cost.

D. Orderly Development of the Region [30 V.S.A. § 248(b)(1)]

70. The Project will not unduly interfere with the orderly development of the region, with due consideration having been given to the recommendations of the municipal and regional planning commissions, the recommendations of municipal legislative bodies, and the land conservation measures contained in the plan of any affected municipality. This finding is supported by findings 71 through 84, below.

71. The municipalities directly affected by components of the Project include: the towns of Vernon, Guilford, Brattleboro, Dummerston, Newfane, Brookline, Townshend, Grafton, and Windham, each of which is a member of the Windham Regional Commission; and the towns of Andover, Chester, Ludlow and Cavendish, each of which is a member of the Southern Windsor

County Regional Planning Commission. Upton pf. at 3. Components of the Project that affect these municipalities are as follows:

- (a) about 3.7 miles of the 360 Line will run through Guilford. Upton pf. at 6.
- (b) about 5.7 miles of the 360 Line will run through Brattleboro. Upton pf. at 8.
- (c) about 3.8 miles of the 360 Line will run through Brookline. Upton pf. at 16.
- (d) about 9 miles of the 360 Line will run through Townshend. Upton pf. at 17.
- (e) about 1 mile of the 360 Line will run through Grafton. Upton pf. at 20.
- (f) about 5.3 miles of the 360 Line will run through Windham. Upton pf. at 21.
- (g) about 4.1 miles of the 360 Line will run through Andover. Upton pf. at 23.
- (h) about 5.2 miles of the 360 Line will run through Chester. Upton pf. at 24.
- (i) a small portion of the existing right-of-way is located in the southeast corner of Ludlow such that the 360 Line will run briefly through Ludlow as it crosses from Chester into Cavendish between two proposed utility pole structures. Upton pf. at 26; exh. Petitioners SD-2 at 40.
- (j) about 2.8 miles of the 360 Line will run through Vernon, and the new Vernon Substation will be constructed there. Upton pf. at 4.
- (k) about 4.9 miles of the 360 Line and a 1,200 foot section of the Newfane Loop will run through Dummerston. Upton pf. at 10.
- (l) about one mile of the Newfane Loop and the Newfane Substation will be located in Newfane and about one mile of the 360 Line will run adjacent to the Dummerston-Newfane border in Dummerston. Upton pf. at 13.
- (m) about 5.5 miles of the 360 Line will run through Cavendish, and the Coolidge Substation in Cavendish will be expanded as part of the project. Upton pf. at 28.

72. Town plans of several of the affected municipalities and two regional plans encourage or, in the case of Windham, appear to require the use of existing utility corridors for new transmission lines. Town plans of several of the affected municipalities, and the two regional plans generally require the consideration of aesthetic, natural resource, environmental and/or other impacts when locating new utility lines. Upton pf. at 4 (citing Vernon Town Plan at 4 and 34); Upton pf. at 7 (citing Guilford Town Plan at 17); Upton pf. at 10 (citing Dummerston Town

Plan at 33); Upton pf. at 18 (citing Townshend Town Plan at 25); Upton pf. at 22 (citing Windham Town Plan at 16); Upton pf. at 25 (citing Chester Town Plan at 31-32); Upton pf. at 25 (citing Chester Town Plan at 31-32); Upton pf. at 28 (citing Andover Town Plan at 9); Upton pf. at 28-29 (citing Cavendish Town Plan at 23); Upton pf. at 31-32; Upton pf. at 35; exhs. Petitioners TOU-2, TOU-3, TOU-8, TOU-10, TOU-12 and TOU-14.

73. The 360 Line will be located within the right-of-way of the existing 340 Line. The siting of the 360 Line in an existing utility corridor is consistent with the recommendations contained in the town plans of several of the affected municipalities, and this siting is likely to reduce scenic, natural resource and other impacts. LaForest pf. at 18; Upton pf. at 4, 8, 10, 18, 22, 25 and 28.

74. Town plans of a few of the affected municipalities encourage the installation of underground utility lines in certain locations or where feasible. However, none of the town plans would require the construction of the 360 Line underground, and the 360 Line will be constructed in a utility corridor in which a transmission line (the 340 Line) already exists. The additional costs of underground construction are not justified under the circumstances. Upton pf. at 5-6; Upton pf. at 5 citing Vernon Town Plan at 35; Upton pf. at 25 (citing Chester Town Plan at 31-32); Upton pf. at 28-29 (citing Cavendish Town Plan at 23).

75. There are no relevant land conservation measures that would be applicable to the Project in the town plans of Vernon, Guilford, Brattleboro, Dummerston, Newfane, Brookline, Townsend, Grafton, Windham, Andover, Chester, Ludlow or Cavendish. While there are no specific land conservation measures in the town plans of Dummerston or Newfane, portions of both the 360 Line and the Newfane Loop in Dummerston and of the Newfane Loop in Newfane are located on lands that are identified as protected areas under the Towns' future or proposed land use maps. The impact of the new transmission lines is reduced by locating the 360 Line in the existing right-of-way of the 340 Line and, to a lesser extent, by locating the Newfane Loop in and adjacent to the existing right-of-way for the existing 46 kV transmission line of CVPS. Upton pf. at 5, 7, 9, 10-11, 13-14, 17, 19, 21, 23, 25, 27 and 29.

76. Environmental and aesthetic reports related to the Project and the testimony of Mr. Stamatov address strategies to minimize the Project's impacts on aesthetics and the visual

landscape, on the environment, and on natural, scenic and historic resources. Upton pf. at 5, 7, 9, 11, 15, 17, 19, 20-21, 23, 25, 27, 29 and 36; exh. Petitioners SD-2; exh. Petitioners MJB-2; Stamatov pf. at 2-16.

77. The Townshend Town Plan seeks to ensure that public utility companies have demonstrated that they are maximizing efficiencies and assisting customers in energy conservation before constructing additional generation and transmission facilities. CVPS has undertaken energy conservation measures in its service area in this region and has indicated that it continues to look for ways to maintain reliable service through the use of targeted conservation efforts. Upton pf. at 18 (citing Townshend Town Plan at 25) and 19.

78. The Scenic Resources Map in the Brookline Town Plan includes the land located between Grassy Brook Road and Hill Road, an area crossed by the proposed 360 Line as well as the existing 340 Line, as a scenic viewshed area. The Town Plan contains a land use policy to require public utilities to "minimize the impact on the environment and to assist desired development patterns." The siting of the 360 Line in the existing right-of-way of the 340 Line would reduce the impact of the 360 Line on this scenic viewshed area. Exh. Petitioners TOU-7; Upton pf. at 16.

79. The Petitioners provided Project plans on June 7, 2007, to the Windham Regional Commission, the Southern Windsor County Regional Planning Commission and the selectboards and planning commissions of Vernon, Guilford, Brattleboro, Brookline, Dummerston, Newfane, Townshend, Grafton, Windham, Andover, Chester, Ludlow and Cavendish. VELCO staff met with members of the Selectboards and Planning Commissions from Vernon, Brattleboro, Guilford, Brookline, Newfane, Townshend, Windham and Cavendish during the period August 13, 2007, to September 5, 2007, to discuss the Project in more detail. VELCO staff also met with the Planning Commission and Town Manager of Ludlow on August 21, 2007. K. Johnson pf. at 16-17.

80. A public meeting was held in Dummerston on July 11, 2007, at which significant concerns were expressed regarding the initial proposal to construct a 345 kV loop connecting the proposed 360 Line to an expanded, existing CVPS substation in Dummerston. Upton pf. at 11-12; K. Johnson pf. at 16.

81. The current proposal was developed as an alternative to address these public concerns about the initial proposal. It involves the construction of the Newfane Substation that lies along the existing CVPS 46 kV right-of-way rather than an expansion of the existing CVPS substation in Dummerston. On September 14, 2007, the Dummerston Planning Commission provided comments in which it advised the Board, based on the information provided to that date, that the proposal for the Newfane Substation and Newfane Loop is a better alternative than the initial proposal and that it presented no significant conflicts with the Dummerston Town Plan. Upton pf. at 12; exh. Petitioners KJ-14.

82. The Newfane Substation will be located on the site of an existing gravel extraction operation. The Newfane Substation will reduce certain negative effects of gravel pits identified in the Newfane Town Plan and will ensure the reclamation of the existing gravel pit. Upton pf. at 14 (citing Newfane Town Plan at 43).

83. The Newfane Loop will be located within and adjacent to the transmission corridor for the existing 46 kV transmission line of CVPS. McNamara pf. at 11.

84. At a meeting with Newfane Selectboard and Planning Commission members on August 16, 2007, VELCO staff discussed the proposal to construct a new substation in Newfane. The Selectboard held a public meeting on September 17, 2007, for the purpose of receiving public input on the plans for the Newfane Substation and Newfane Loop. Upton pf. at 15; K. Johnson pf. at 16-17; exh. Petitioners KJ-14.

Discussion

Section 248(b)(1) provides in pertinent part that, before the Board may issue a certificate of public good for an in-state facility, the Board shall find that the facility "will not unduly interfere with the orderly development of the region with due consideration having been given to the recommendations of the municipal and regional planning commissions, the recommendations of the municipal legislative bodies, and the land conservation measures contained in the plan of any affected municipality." 30 V.S.A. § 248(b)(1).

Several municipalities participated in these proceedings. The Towns of Brattleboro, Brookline, Cavendish, Dummerston, Newfane and Townshend and the Windham Regional

Commission all filed motions to intervene in this proceeding. These motions were granted by the Board's Order of February 8, 2008, on a permissive basis limited to issues related to the interests each identified in its intervention request. The Towns of Brattleboro, Cavendish, Newfane and Townshend did not file testimony in this proceeding, nor did they file any motions, briefs or comments with the Board subsequent to the grant of their motions to intervene. The Town of Brattleboro filed a motion on September 3, 2008, to withdraw from this proceeding, which was granted in the Board's Order of October 1, 2008. The Town of Brookline participated in discovery and initially sponsored prefiled testimony. A town representative filed notice on September 5, 2008, in response to the Board's Procedural Order of August 27, 2008, advising the Board that the town was discontinuing its sponsorship of testimony and its active participation in this proceeding, even though it continued to have concerns about the aesthetic impacts of the Project in Brookline. The town made no additional filing in support or opposition to the Project. The Town of Dummerston sponsored the prefiled testimony of Kurt Yeager regarding the need for the Project and Alex Wilson on the Three-bird orchid. The Windham Regional Commission did not file any testimony or briefs, but it did participate in the technical hearings.

The Southern Windsor County Regional Planning Commission and the Towns of Andover, Chester, Grafton, Guilford, Ludlow, Vernon and Windham did not intervene in these proceedings, nor did they file any written comments with the Board.

Consistent with the above findings, we conclude that the proposed Project will not unduly interfere with the orderly development of the region. We base this conclusion upon the admitted testimony and exhibits, including with regard to the local and regional plans of the affected communities. The use of the existing transmission corridor for the vast majority of the Project limits the impact of the Project on orderly development.⁵ Other Project components involve the construction of a new substation at Vernon adjacent to existing generation and transmission infrastructure and the expansion of an existing substation facility in Coolidge. The siting of the Newfane Substation and the Newfane Loop was undertaken in response to community concerns

5. "The effects of the proposed Project on the orderly development of the region are limited by the use of existing transmission corridors and existing substation locations for the vast majority of the Project." *In re: Northwest Vt. Reliability Project*, Docket No. 6860, Order of 1/28/05 at 203, citing *Petition of VELCO*, Docket No. 4381, Order of 3/6/80 at 4-5.

about the original proposal to expand the existing substation in Dummerston and to connect that substation to the 360 Line with a loop in Dummerston.

We also note that the Project will enhance the reliability of electric service in southern Vermont and in the state as a whole, as discussed in the findings under Section 248(b)(2) of this Order. In this way the Project may aid the orderly development of the region.

E. Need for Present and Future Demand for Services [30 V.S.A. § 248(b)(2)]

85. The Project is required to meet the present and future demand for services which could not otherwise be provided in a more cost-effective manner through energy conservation programs and measures and energy efficiency and load management measures. This finding is supported by findings 86 through 269, below.

(1) Regional and National Reliability Standards

86. The New England transmission system is a fully integrated regional power system. Most of the transmission lines are relatively short and networked as a grid, resulting in close inter-relationships of electrical performance throughout the system. Kowalski pf. at 7.

87. The widespread outage that struck the North American electric power system on August 14, 2003, causing the loss of approximately 2,500 MW of load in New England, has underscored the significance of a reliable bulk power transmission system. Kowalski pf. at 6.

88. The transmission-planning process involves a number of stages, including:

- (a) developing a model of the bulk power systems;
- (b) using this model to assess the performance of the system for a range of operating conditions and contingencies;
- (c) determining those operating conditions and contingencies that have an undesirable reliability impact;
- (d) identifying the nature of potential options; and
- (e) developing and evaluating a range of solutions, taking into account the time needed to place the solution into service.

Laforest/Diebold pf. at 11.

89. ISO-NE was established as the Independent System Operator of the New England bulk power grid on July 1, 1997. Kowalski pf. at 3-4.

90. As the Independent System Operator for New England, ISO-NE is responsible for the regional transmission-planning process, and is required to maintain a level of system reliability that meets criteria established by the New England Power Pool ("NEPOOL"), the North American Electric Reliability Corporation ("NERC") and the Northeast Power Coordinating Council ("NPCC"). *Id.* at 4, 6.

91. NERC has been designated as the Electric Reliability Organization ("ERO") charged by the Federal Energy Regulatory Commission ("FERC") to enforce mandatory compliance with federal standards on power system design, among others. LaForest/Diebold pf. at 5.

92. NERC oversees a number of regional councils, one of which is the NPCC. Kowalski pf. at 8.

93. NERC has established a general set of mandatory rules and criteria applicable to all geographic areas. NPCC has issued rules and criteria particular to the Northeast, which also encompass the more general NERC standards. *Id.*

94. In turn, ISO-NE has developed standards and criteria specific to New England that coordinate with the NPCC rules. *Id.*

95. Similar reliability standards exist throughout the nation and other portions of North America. *Id.*

96. As a transmission operator of Vermont's high voltage transmission facilities (115 kV and above), and pursuant to the restated New England Power Pool Agreement and the New England Open Access Transmission Tariff, VELCO's transmission system must meet the design and operating reliability criteria of ISO-NE and the NPCC, as well as national Reliability Standards established by NERC. LaForest/Diebold pf. at 4.

97. Overall, these criteria all seek to ensure a robust electric system that can deliver electric energy to the sub-transmission and distribution systems served by the transmission owners. This objective serves to minimize the probability of widespread electric outages. Kowalski pf. at 8.

98. The reliability standards of ISO-NE and NPCC require that the interconnected bulk power supply system be designed with sufficient transmission capability to serve forecasted loads

under representative contingencies as defined in the criteria, and they apply after any one critical element has already been lost. This is referred to as the N-1-1 criterion. LaForest/Diebold pf. at 6-7; exh. Petitioners DLL/CD-2 (ISO-NE Planning Procedure No. 3, Reliability Standards for the New England Area Bulk Power Supply System); exhs. Petitioners DLL/CD-3 (NPCC Basic Criteria for Design and Operation of Interconnected Power Systems) and DLL/CD-4 (NPCC Bulk Power System Protection Criteria).

99. The second paragraph of Section 3.0 of Planning Procedure No. 3 provides that testing is to be performed with the system reasonably stressed in terms of applicable transfers, load and resources. LaForest/Diebold pf. at 7.

100. In order to be in compliance with the ISO-NE Reliability Standards, a system must satisfy each and every criterion set forth in the standards. Kowalski pf. at 14.

101. The NERC Standards for transmission planning consist of six Reliability Standards (TPL-001-0 through TPL-006-0). These Reliability Standards are intended to ensure that the transmission system is planned and designed to meet an appropriate and specific set of reliability criteria. LaForest/Diebold pf. at 7; exh. Petitioners DLL/CD-5.

102. The NERC Reliability Standards address types of simulations and assessments that must be performed to ensure that systems are developed to reliably meet present and future system needs (TPL-001-0 through TPL-004-0) and that the information required to assess regional compliance with planning criteria and for self-assessment of regional reliability is available and accurate (TPL-005-0 and TPL-006-0). LaForest/Diebold pf. at 7-8.

103. These assessments consider system performance with all facilities in service (TPL-001-0), system performance with a single facility lost (TPL-002-0), and system performance with multiple facilities lost (TPL-003-0 and TPL-004-0). *Id.* at 8; exh. Petitioners DLL/CD-5.

104. Failure by VELCO to maintain its system according to the NERC Standards could result in enforcement actions, including penalties of up to \$1,000,000 per day per infraction. LaForest pf. at 9-10.

105. Whether developed by NERC, NPCC, or ISO-NE, the reliability standards and criteria applicable to the New England transmission system are applied in a deterministic fashion in

order to assess the ability for it to perform under a series of defined contingency situations. Specifically, these standards and criteria dictate a set of operating circumstances or contingencies under which the New England transmission system must perform without experiencing overloads, instability, or voltage violations. Kowalski pf. at 8-9.

106. In addition to the deterministic reliability standards, VELCO is subject to the NERC Transmission Vegetative Management Reliability Standard, FAC-003-1 (Exhibit Petitioners JD-4), which FERC adopted on March 16, 2007. FERC Order No. 693, at 201; Disorda pf. at 7-10.

107. The NERC Vegetation Management Reliability Standard establishes two primary reliability requirements: Requirement R1 requires a transmission owner to develop a transmission vegetation management program; and Requirement R2 requires a transmission owner to implement the program and to document its implementation. Each program must be designed for the geographical area and specific design configurations of the transmission owner's system. FERC Order No. 693, at 198; Disorda pf. at 8.

108. The NERC Vegetative Management Standard is mandatory, and applies to all transmission lines operated at 200 kV and above and to any lower voltage lines designated by the Regional Reliability Organization (NPCC) as critical to the reliability of the electric system in the region. Disorda pf. at 9; exh. Petitioners JD-4 at A.4.3.

109. The NERC Vegetative Management Standard applies to the existing Vernon-to-Coolidge 345 kV line, the proposed new Vernon-to-Coolidge 345 kV line, and to the proposed Newfane Loop 345 kV line, because they are at voltages above the 200 kV threshold. Disorda pf. at 9-10.

110. ISO-NE recently adopted a regional transmission vegetation management standard, ISO-NE Operating Procedure 3 (the "OP3 Standard"), Appendix C-ISO New England Right-of-Way Vegetation Management Standard (February 1, 2005). Disorda pf. at 11; exh. Petitioners JD-6.

111. The OP3 Standard applies to transmission voltages of 69 kV and above, and therefore applies to all VELCO rights-of-way. Disorda pf. at 11-12.

(2) The Regional Transmission System Problems

(a) Loss of Existing 345 kV Vernon-to-Cavendish Line

112. Two of the most critical transmission-system elements on the Vermont system are (1) the Plattsburgh-to-Sandbar 115 kV or "PV20" line, and (2) the Highgate HVDC Converter. Both facilities are at risk of long-term outages. If either of these facilities is out of service on a peak day, the existing 345 kV Vernon-to-Cavendish 340 Line can carry almost half of Vermont's total demand. In such circumstances, loss of the 340 Line could result in overloading of other transmission lines and voltage collapse, exposing almost all of Vermont and significant portions of New York and New Hampshire to blackout. Laforest/Diebold pf. at 13–17; exh. Petitioners DLL/CD-11; findings 113–125, below.

113. The PV20 115 kV line has two sets of underwater cables in Lake Champlain that are 1.8 miles in length and over fifty and thirty-five years old, respectively. The PV20 circuit also has an underground cable along the two miles of the Route 2 causeway. This underground cable is ten years old, while the Sand Bar phase-shifting transformer has been in service for over three years. All of these elements have the potential for long-duration outages following failure and may result in the long-term loss of the power system element in question. Laforest/Diebold pf. at 12.

114. The Highgate HVDC Converter is over twenty years old and may be within a decade of potential retirement based on expected equipment lifetime and maintenance needs. A converter-valve-hall fire, which has befallen all other converters of Highgate's age, would make the facility unusable for at least a year. *Id.*

115. In addition, failure of the converter transformer would place the facility out of service for many days at least. Because the converter transformers are unique, the transformers cannot be replaced by similar units found elsewhere within the industry. *Id.* at 11-12.

116. In accordance with the N–1–1 requirement, VELCO's planning analyses model the system after loss of either of these critical facilities followed by the loss of another system element. Loss of the PV20 line is a more limiting contingency, or outage, which results in a more limited transmission network, with system performance compromised at a lower Vermont

state load level (by about 35 MW) than in the Highgate-out scenario. This means that the long-term loss of the PV20 circuit is more limiting than the Highgate-out scenario. *Id.*

117. Transmission planning analyses for this Project reveal that the transmission system in Vermont will not meet NERC Transmission Planning Standard TPL-003-0, titled "System Performance Following Loss of Two or More Bulk Electric System Elements (Category C)." *Id.*

118. Category C outages, which are outages including the loss of two or more system elements, include those tests that address the N-1-1 design standard, which is the specific portion of the standard that the Vermont transmission system violates. *Id.* at 10.

119. Acceptable system performance for these types of events requires stable system performance with thermal and voltage performance within the applicable rating or limits. The Vermont transmission system violates both thermal and post-contingency voltage criteria for loss of the existing Vernon-to-Cavendish 345 kV line. *Id.*

120. Because Vermont system performance violates NERC standard TPL-003-0, the studied system performance also violates NPCC and ISO-NE standards, which are required to conform to the NERC standards. *Id.* at 11.

121. The existing Vernon-to-Cavendish 345 kV line serves critical east-west and north-south energy transfers within New England and into and out of New York. *Id.* at 14.

122. The existing Vernon-to-Cavendish 345 kV line can carry 45% or more of Vermont's total demand on peak days, and even higher proportions if either the PV20 tie with New York or the Highgate DC Converter are unavailable. *Id.* at 13-14.

123. If this 345 kV line is lost, numerous 115 kV lines can be overloaded in multiple states, potentially resulting in voltage collapse and blackouts impacting an area extending from north of the Capital District Area in New York (Albany, Schenectady and Troy) through Glens Falls, Saratoga and Whitehall, into central and northern Vermont, and to areas in and around central and northern New Hampshire. *Id.*; exh. Petitioners DLL/CD-10.

124. In this scenario, it is likely that the system voltage could degrade in moments. This voltage degradation could result in line relays being "fooled" by high reactive power flows and low voltages into believing that an actual line fault exists, as opposed to low-voltage phenomena following an outage. These relays, if they act in this manner, would take action within roughly a

half second to a few seconds. This would most likely occur in New York in the 115 kV network north of the Albany/Troy area and south of Whitehall. LaForest/Diebold pf. at 15-16.

125. Approximately 1000 MW of Vermont load, 580 MW of New York load, and 250 MW of New Hampshire load is at risk of voltage collapse or blackout in the event of an outage involving this 345 kV line. *Id.* at 17; exh. DLL/CD-11.

126. Numerous planning analyses have demonstrated that the Project is needed to address reliability problems. These analyses include the Northwest Vermont Reliability Project ("NRP") Critical Load Milestone Study, the 2006 Vermont Transmission System 10-Year Long Range Plan Analysis, the Southern Loop Project Analysis Summary and Update, and the 2012 VELCO System Assessment. Exhs. Petitioners DLL/CD-6, -7, -8, and -9.

127. The regional reliability problems addressed by the Southern Loop Project were identified as the next needed significant system upgrade in the Critical Load Study prepared by VELCO for the NRP. In that study, VELCO reported that a PV20 outage with loss of the Vernon-to-Coolidge 345 kV line would result in voltage collapse at an 1165 MW load level (with NRP upgrades in service). LaForest pf. at 11-12; exh. Petitioners DLL/CD-6.

128. The VELCO 2006 Long-Range Transmission Plan Analysis identified the need for the Southern Loop Project as the most significant problem on the system. LaForest pf. at 12; exh. Petitioners DLL/CD-7.

129. The Vermont critical load level for this Project is influenced not only by Vermont load levels but also by adjacent local and regional load levels, regional power transfer conditions and system modeling updates. LaForest pf. at 12– 13.

130. Studies reveal significant changes in the New York model north of Schenectady/Albany, as well as noteworthy load growth in New Hampshire and the remainder of New England. These changes, when reflected in the power system models, resulted in significant increases in existing Vernon-to-Cavendish 345 kV line flow. *Id.* at 13.

131. That is, as regional load grows, the existing Vernon-to-Cavendish 345 kV line supplies not only increased Vermont load, but also supplies a portion of increased regional demand in adjacent areas. Load levels modeled in New Hampshire have a noticeable impact. LaForest pf. at 13.

132. The impact of load growth outside of Vermont on the Vermont "need" level for this Project is non-linear. As New England peak load increases, Vermont peak load must actually decrease, to maintain system reliability without the additional 345 kV line. LaForest pf. at 13.

133. VELCO planning studies filed in November, 2007 for this proceeding indicated that under a given set of assumptions, the existing system begins to violate thermal and voltage criteria, post-contingency, at a Vermont load level of 1,155 MW. Smith pf. at 11.

134. Subsequent analysis revealed that four factors, when taken into consideration, result in a system load-serving capability that is 210 MW less than the 1,155 MW target load level. This results in the revised target load level, for the year 2011, of 945 MW. Smith pf. at 14.

135. These four factors are:

- (a) - 35 MW attributable to the expected load level in adjacent states and throughout the NEPOOL system in year 2011;
- (b) - 100 MW attributable to a change in the post-contingency voltage level from 0.92 per unit (92% of nominal rated voltage) to the ISO-NE standard of 0.95 per unit;
- (c) - 35 MW to account for the droop effect of the dynamic var devices on the VELCO system; and
- (d) - 40 MW to account for absence of a New Hampshire generator.

Smith pf. at 13-14.

136. The Project is needed to address the potential loss of the existing 345 kV Vernon-to-Cavendish line at a statewide load level of 945 MW in 2011. Smith pf. at 12-14.

137. The VELCO system reached a peak load of 1,118 MW on August 2, 2006, which significantly exceeds the load level at which the Project is needed. Exh. DPS-BKH-2 at 3.

138. The Vermont transmission system has experienced two significant events over the past two summers that resulted in poor system voltage performance that risked, and in one case resulted in, load shedding or voltage collapse. LaForest pf. at 16.

139. A recent event in New York which stressed the Vermont 345 kV tie forced VELCO to ask New York operators to shed approximately 100 MW of load in New York to avoid widespread blackouts, potential damage to equipment and risk to human safety. *Id.*

(b) Loss of VY 345/115 kV transformer

140. The second regional reliability problem arises if the Vermont Yankee 345/115 kV transformer located at the Vermont Yankee substation in Vernon (at the southern end of the Vernon-to-Cavendish 345 kV line) is lost. This transformer connects the New England 345 kV network to the local 115 kV system, which in turn supplies load in southeastern Vermont (Brattleboro and surrounding areas) and southwestern New Hampshire. LaForest/Diebold pf. at 20.

141. Loss of this transformer places all local loads in southeastern Vermont and southwestern New Hampshire on the 115 kV network supplied solely out of the PSNH network in New Hampshire, and the CVPS 46 kV network supplied remotely from Bennington. *Id.* at 20-21.

142. Loss of this transformer, which is over 35 years old, may result in a shutdown of the Vermont Yankee Nuclear Power Plant. *Id.*

143. There are few, if any, local options for alternate supply at or near peak summer demand levels. *Id.* at 21.

144. Outages on these remaining local transmission (115 kV) and local sub-transmission (46 kV) facilities would lead to loss of local load until the lost facilities are restored. *Id.*

145. In these scenarios 30 to 50 MW of CVPS load in southeastern Vermont and 150 to 200 MW of load in southwestern New Hampshire could be lost. *Id.*

146. At present-day load levels and system configuration, and in the interim before transmission reinforcements may be implemented, the transmission system is vulnerable to voltage sags, thermal overloads, loss of customer load, and possibly widespread voltage collapse. Smith pf. at 4; Kowalski pf. at 11.

147. From a reliability perspective, Vermont is faced with a threatening combination of growing summer peak demand, limited transmission capacity, and extremely limited generation that is effectively integrated to serve the demand. Kowalski pf. at 10.

148. As a result, the transmission system must be sufficiently robust to import needed electricity into and around this region. However, the amount of electricity that the existing transmission system can import from other areas and transmit within the southern region of Vermont is limited in its ability to provide reliable service while sustaining losses of facilities on

the transmission system, putting the region at an unacceptable risk of loss of service to load due to a cascading system failure, or blackout. *Id.* at 11.

149. The Northeast Blackout of August 14, 2003, demonstrates that if voltage collapse occurs, it can spread in a matter of seconds over a large geographic area, creating massive blackouts and resulting damages and loss. *Id.* at 12.

150. There are two consequences of an uncontrolled blackout. First, it is often difficult to accurately predict how large an area will be affected by a blackout, and as a result, it could encompass the entire northeastern United States, as happened in 1965 and again on August 14, 2003, when parts of the Midwest and Canada were also affected along with the Northeast. Second, it may result in electric system equipment damage that will hamper restoration of service, thus prolonging outages, and making efforts to remedy the system more expensive. *Id.*

151. Overloading of transmission lines not only can lead to voltage collapse, but it can also cause poor voltage performance and thermal overloads. Low voltages reduce the ability of appliances and machinery to function. LaForest/Diebold pf. at 17.

152. Some appliances will not run below a specified voltage level, and prolonged operation at reduced voltage can prematurely age or damage an appliance. High voltage may damage equipment, such as computers, light bulbs, and televisions. Large voltage changes, a phenomenon that occurs on weaker transmission systems, can be noticeable to individuals and can affect sensitive equipment, such as computers and certain manufacturing machinery. *Id.* at 17-18.

153. Such voltage changes are not just a nuisance; they can affect manufacturing processes and result in significant financial loss. The impact of even momentary power disturbances can be quite severe in technology manufacturing facilities, such as IBM's. Poor voltage performance can result in significant production and financial losses. *Id.* at 18; *see* exh. Petitioners DLL/CD-17 (testimony of Robert G. Lang to the Vermont House Commerce Committee, October 29, 2003).

154. Thermal overloads accelerate equipment aging and deterioration, may cause irreversible damage to transmission equipment such as transformers, and present a public safety risk.

Conductors can sag below safe clearances and transformers can burn out. LaForest/Diebold pf. at 18.

155. While transmission lines can normally be repaired in a matter of hours, other types of equipment, such as transformers, can require weeks or months to be repaired or replaced. *Id.*

156. The lead time to replace a transformer is in the range of nine to eighteen months. The long lead times needed for procurement and construction of replacement equipment would significantly reduce the ability of the system to reliably serve load in the interim. *Id.* at 18-19.

(c) Breaker Failures at Vermont Yankee Substation

157. Breaker failures at Entergy's Vermont Yankee 345 kV Substation can result in both the loss of the 340 Line and other key power system elements. Thus a breaker failure on either side of the existing Vernon-to-Cavendish 345 kV or 340 Line termination can result in a weaker system with poorer system performance than loss of the line itself. Loss of the breaker between the 340 Line and the Vermont Yankee unit (breaker "1T") results in both the loss of the 340 Line and over 600 MW of generation. LaForest/Diebold pf. at 19-20.

158. The loss of generation in combination with loss of the 340 Line further degrades the system's voltage and thermal performance. Loss of the other 340 Line terminal breaker at Vermont Yankee (the "79-40" breaker) results in coincident loss of both a key north-south 345 kV line and an east-west 345 kV line, with degraded system voltage performance and an increased likelihood of voltage collapse. *Id.*

159. These breaker-failure scenarios could result in the loss of load in the magnitudes described earlier with the timing of voltage collapse potentially much quicker (due to higher loadings on weak transmission lines and poorer voltage performance making it more likely that relay systems may act automatically to sectionalize the system). *Id.*

160. These breaker-failure scenarios are potentially more likely in the Vermont Yankee substation because the protection and control equipment is old and does not conform fully to the modern standards for a bulk-power-system substation. The relays employ technology no longer supported by manufacturers, which means no spare equipment exists except for those parts

gleaned from decommissioning identical relays elsewhere and cannibalizing the mothballed relay for parts for the in-service unit. *Id.* at 20.

161. With the addition of the new 345 kV line or any other additional facility, the substation at Vermont Yankee needs to be upgraded to meet compliance with NERC, NPCC and ISO-NE design standards for a bulk-power-system substation. *Id.* at 24.

(3) Local Reliability on the CVPS System in Southern Vermont

162. Originally, the Southern Loop Project was part of a study area included in the so-called Southern Loop Area Specific Collaborative ("Southern Loop ASC"), Docket No. 6806. The Southern Loop ASC considered the reliability concerns over the CVPS 46 kV subtransmission loop between Bennington and Brattleboro. Over time, analyses of CVPS southern loop reliability issues expanded to consider possible synergies with projects that could address VELCO system deficiencies and other regional reliability needs. Smith pf. at 3.

163. The areas served by CVPS's 46 kV Southern Loop experienced strong growth in electric demand during the 1960s and 1970s, driven largely by the expansion of the ski resorts and related electric customers. In 1970 the radial spurs of 46 kV transmission emanating from Brattleboro and Bennington were extended and tied together to increase system strength and redundancy. This subtransmission circuit came to be known as the CVPS Southern Loop. Kirby/Jones pf. at 7.

164. By the early 1980s it appeared that demand growth in this target area might soon surpass this system's capability, particularly during transmission line or transformer failures on the 46 kV loop itself or on the overarching 115 kV system. In 1983, CVPS filed a petition under 30 V.S.A. § 248 seeking a certificate of public good to construct the Chester-Londonderry 46 kV line extension, in order to provide another source of transmission supply near the loop's weak center. *Id.*

165. The Board denied this petition, citing several weaknesses in CVPS's application in its Order of April 10, 1986, in Docket No. 4782. *Id.*

166. CVPS has addressed growing electric demand in this area by two principal means: (1) the installation of switched shunt capacitors along the loop to support its voltage; and (2) the use of demand-side management ("DSM") to ease the load on the system. *Id.* at 8.

167. These DSM measures have included interruptible contracts for the ski resorts, end-use fuel switching, load control, and conservation and efficiency programs. Some of the DSM programs are now administered by Efficiency Vermont ("EVt"), Vermont's energy efficiency utility or "EEU." *Id.*

168. Additionally, a second 115/46 kV transformer was added at the Woodford Road Substation in Bennington in 1995 in order to provide redundancy and to share the demand with the original transformer, which was becoming vulnerable to overload for some contingencies. *Id.*

169. Today, the two main strategies for managing demand growth in the target area have run their course and are now becoming ineffective at managing further growth solely by themselves. *Id.*

170. DSM efforts have resulted in much of the peak customer demand being shifted to off-peak hours, leading to increasingly long periods of high demand with a less distinct peak period and a higher area demand factor or load factor. These high-load periods occur primarily during winter months. *Id.* at 8-9; exh. Petitioners KJ/LK-4, Appendix H.

171. This demand shift has led to an unacceptably high risk of voltage collapse, because a critical contingency may occur during the increasing long periods of system vulnerability. Kirby/Jones pf. at 9.

172. An extensive planning study by CVPS, with input from VELCO, identified five distinct root problems in southern Vermont that affect the reliability and adequacy of service in this target area and must be resolved. These root problems are:

Root Problem #1 - The present-day CVPS Southern Loop subtransmission system is vulnerable to an unplanned loss of a transmission line or a transformer much of the time.

Root Problem #2 - The present-day Brattleboro-area system is vulnerable to an unplanned loss of a transmission line or a transformer 100% of the time.

Root Problem #3 - The southern Vermont system (and the southwestern New Hampshire system) are both vulnerable to a long-term outage of the T4 345/115 kV transformer at the Vermont Yankee nuclear plant.

Root Problem #4 - Central Vermont's Southern Loop subtransmission system will soon be unable to supply peak demand within the target area even with all facilities in service, due to demand growth.

Root Problem #5 - Future problems related to the southern Vermont system will soon have the potential to impact the wider regional transmission system including most of Vermont.

Kirby/Jones pf. at 10.

173. Based on the assumptions used, loads fed by the Southern Loop subtransmission system are subject to local blackouts for credible contingencies even at moderate load levels. This results in exposure to blackouts with present-day loads for more than 50% of the time. This exposure will increase with future load growth. Even with all lines in service, sometimes referred to as the N-0 condition, if no transmission upgrades are made, the existing Southern Loop configurations will become unable to maintain voltage and serve peak loads in the three-to-five year time frame. Smith pf. at 16-17.

(4) How the Proposed Project Addresses the Reliability Problems

174. With the completion of the proposed second Coolidge-to-Vermont Yankee 345 kV line, loss of one 345 kV line in the corridor still leaves the other to perform the necessary network function within this corridor from the regional bulk system perspective. LaForest/Diebold pf. at 24.

175. The proposed new substation in Vernon, just north of the Vermont Yankee substation, will address the breaker-failure contingencies by removing key elements of the local power system from adjacent breaker positions within the new Vernon substation. *Id.*

176. A second 345/115 kV autotransformer will be installed in this new substation, removing the local load reliability susceptibility for loss of the sole Vermont Yankee 345/115 kV autotransformer. *Id.*

177. By addressing these deficiencies, the Project will also bring the system into conformance with national and regional reliability standards. LaForest/Diebold pf. at 24.

178. In addition to improving the reliability of the Vermont transmission system, the stronger, more stable transmission system resulting from the Project will provide a more robust framework with regard to generation in Vermont, as well as providing this area access to generation from elsewhere in Vermont and New England. This will reduce congestion that results from operational reliability constraints. Smith pf. at 19-20.

179. The added transmission strength afforded by the Project will result in added stability and power quality benefits, particularly through redundancy of the added 345 kV line from Vernon to Coolidge. *Id.* at 20.

180. The presence of a second line substantially reduces the shock to the system caused by electrical faults on either line and subsequent loss of that line. The presence of the second line from Vernon to Coolidge will also provide additional operational flexibility and provide enhanced windows of opportunity to perform system maintenance. *Id.*

181. The addition of the second 345 kV line will also result in loss savings. With all lines in service, and with load levels estimated by VELCO for year 2014, the Vermont loss savings are on the order of 3.6 MW. The corresponding New England loss savings are on the order of 10 MW. *Id.*

182. The Project addresses the local CVPS reliability problem in southern Vermont by including a new injection point to the 46 kV Southern Loop (new Newfane 345/115/46 kV substation and one-mile 345 kV loop line between the Newfane substation and the new Vernon-to-Coolidge 345 kV line), complementing the ongoing CVPS development of the Kendall Farm Substation, delivery of geographically targeted energy efficiency to the Southern Loop target area, and the CVPS efforts to promote the implementation of customer-cited generation in areas served by the 46 kV sub-transmission system. Jones/Kirby pf. at 4, 16-17, 24-26; exh. Petitioners KJ/LK-6 at 21; KJ/LK-8 at Table F.

183. VELCO has prepared a Transmission Vegetation Management Plan ("TVMP") designed to meet the NERC and ISO-NE transmission vegetation management standards. Disorda pf. at 12; exh. Petitioners JD-2.

(5) Possible Alternatives to Address the Reliability Problems

(a) Transmission Alternatives

184. The Project is superior to all available transmission alternatives, employing synergies to provide least-cost transmission solutions to both regional and local needs. Smith pf. at 4; findings 185 through 202, below.

(i) Transmission Alternatives for Regional Reliability Problems

185. VELCO evaluated four transmission upgrades that might serve as alternatives to the Project. LaForest/Diebold pf. at 35.

186. Two of the alternatives would each involve a new transmission line in parallel with the existing 340 Line. One of these two options would result in the new line operating at 345 kV with the existing 340 Line operated at 115 kV, while the other option would result in both the new line and the 340 Line operating at 345 kV. *Id.* at 35–36.

187. The 115 kV operating option would require a reactive power device at Coolidge, causing that option to be substantially more costly, by at least \$50 million. Tr. 10/29/08 at 115-116, 118 (LaForest); exh. Petitioners LaForest Supp. 1.

188. In addition, the 115 kV operating option may not adequately address the existing reliability problem, given the Project need load level of 945 MW. Tr. 11/6/08 at 21-22 (LaForest).

189. The other two transmission options considered involved new 345 kV lines coming out of 345 kV substations in New Hampshire (with a different substation used in each of the two different options) and terminating at VELCO's Coolidge Substation. These two alternatives would be more expensive than the proposed Project because they involve construction of much longer transmission lines. LaForest/Diebold pf. at 36.

190. The proposed Vermont Yankee-to-Coolidge 345 kV line is superior to the other transmission alternatives. *Id.*; exh. Petitioners DLL/CD-9; findings 191–202, below.

191. The Coolidge Connector component of the Southern Loop Project mitigates reliability concerns and the potential violations of reliability criteria by providing an alternative path for power flow into the Central and Northwest Vermont load zones. Hahn pf. at 6.

192. The Coolidge Connector involves fewer miles of construction of new transmission facilities than the other transmission alternatives and, therefore, is less costly. It also utilizes existing rights of way already owned by VELCO. *Id.*

193. The construction of the Coolidge Connector component of the Southern Loop Project will also facilitate the resolution of reliability and capacity issues on the 46 kV sub-transmission line from Brattleboro to Stratton to Bennington. *Id.*

194. Combining both the 340 Line and 360 Line circuits on the same set of poles is an inferior design because it would leave the system exposed to a double circuit fault and potential voltage collapse. Tr. 11/6/08 at 110 (Smith).

(ii) Transmission Alternatives for Local Reliability Problems

195. To address the five root local-reliability problems (which are described in finding 172), CVPS undertook a long process of analytical studies that resulted in the identification of ten "Strategic Solution Options" to address the root problems. Jones/Kirby pf. at 11; exhs. Petitioners KJ/LK-5 and -6.

196. Using loadflow simulations and forecasted future load growth, CVPS evaluated the ten options for effectiveness in resolving the five root problems. Only three of the ten Strategic Solution Options – numbers 2, 4 and 7 – were fully effective in addressing the five root problems. Jones/Kirby pf. at 12–13, 16; exh. Petitioners KJ/LK-7.

197. CVPS also evaluated the expected cost of each option. Of the three options that could effectively address the five root problems, "Option 7" has the lowest New England societal costs, and the lowest societal costs to Vermont ratepayers when PTF treatment is acknowledged. Jones/Kirby pf. at 16.

198. This effectiveness and cost information was provided to the participants in the public engagement process, through which "Option 7" was identified as the best solution to the CVPS local reliability problems. Jones/Kirby pf. at 12–13.

199. "Option 7" consists of the proposed Project, plus (1) the implementation of up to 24 MW of incremental energy efficiency to defer transmission upgrades in southern Vermont,

and (2) the installation of synchronous condensers at Stratton (which was approved by the Board in Docket No. 7246). Jones/Kirby pf. at 4; Docket No. 7246, Order of March 28, 2008.

200. The Newfane 345/115/46 kV Substation and one-mile 345 kV loop line between the Newfane substation and the Vernon-to-Coolidge 345 kV line provide a critical reinforcement to the CVPS 46 kV subtransmission system and are part of an integrated solution to the CVPS reliability problem in southern Vermont. Jones/Kirby pf. at 11.

201. In combination with the other strategies being implemented by CVPS, the Newfane Substation and loop mitigate the reliability concerns affecting the areas served by the CVPS 46 kV subtransmission system in Southern Vermont. *Id.*

202. These project elements are part of the optimal solution to resolving the local reliability concerns affecting CVPS's southern Vermont service area. *Id.* at 16; exh. Petitioners KJ/LK-7.

(b) Non-Transmission Alternatives ("NTAs")

203. NTAs can consist of energy efficiency ("EE"), demand response ("DR"), or local generation, or various combinations thereof. Hahn pf. at 4.

204. For the past several years, VELCO, CVPS and a group of public stakeholder representatives collaborated in an effort to assess and identify potential solutions to solve the serious reliability problems affecting the southern Vermont and regional systems. LaForest pf. at 10–11.

205. VELCO and CVPS undertook extensive analysis of potential NTA solutions to the local and regional system problems. *See* findings 211 through 223, below.

206. In addition to VELCO's extensive transmission planning, CVPS conducted loadflow, economic, and other analyses to understand the subtransmission system problems in southern Vermont and to help identify potential cost-effective solutions. This effort concluded with the issuance of two summary reports in January of 2006, respectively titled Southern Loop Utility Search Conference Background Report and CVPS Supplemental Technical Report [for] Southern Loop (Exhibits Petitioners KJ/LK-5 and Exhibit Petitioners KJ/LK-6, respectively). Kirby/Jones pf. at 12.

207. The Project incorporates plans for energy efficiency and customer-sited distributed generation in order to defer a potential 115 kV Project component. Findings 215 through 217, below.

208. The proposed Newfane Substation and interconnection with the 46 kV subtransmission system cannot be deferred by non-transmission alternatives, and is the most cost-effective solution among potentially available transmission alternatives. Exh. Stipulation 5 at para. 5.

209. The need for the Project cannot be satisfied by cost-effective generation and efficiency alternatives. Even under the most optimistic and aggressive assumptions regarding generation, DR, and efficiency, the net load cannot be reduced below the peak threshold need levels of 945 MW, and thus cannot avoid or defer the need for the Project. Lamont pf. at 3; *see also* findings 129 through 137, above.

210. The Project is also the most cost-effective and robust solution to solve the severe reliability exposures faced by both the regional and local system networks. *See* findings 260 through 269, below.

(i) NTAs Studied for the Local Reliability Problems

211. CVPS undertook a long process of analytical studies that resulted in the development of ten "Strategic Solution Options," each of which was designed to address all of the root problems. Kirby/Jones pf. at 11.

212. A new synchronous condenser installation at the CVPS Kendall Farm Substation, recently approved by the Board in Docket No. 7246, was an integral component of eight of these ten solution options and presented few lost opportunities in the cases of the remaining two. *Id.*

213. Due to its broad commonality, and because it could promptly remedy two of the most pressing root problems (#1 and #4), the synchronous condenser installation was "decoupled" from the rest of the option components and put on a faster track for implementation by CVPS. *Id.*

214. The synchronous condenser, together with the Project's Newfane Substation and Loop (connecting the 360 Line to the local 46 kV network), in conjunction with deployment of energy

efficiency and customer generation to reduce local peak demand, will defer other transmission elements otherwise needed to address the local reliability concerns in southern Vermont. *Id.*

215. La Capra Associates ("LaCapra") was retained by CVPS to perform an analysis of the potential for distributed generation in the area of Vermont served by the existing 46 kV line from Brattleboro to Stratton to Bennington. Hahn pf. at 4; exh. Petitioners RSH-4.

216. Specifically, a significant element of the Southern Loop Project upgrades that was initially considered – a previously identified approximately 49-mile, 115 kV line upgrade to an existing 46 kV line from Brattleboro to Stratton to Bennington – is being deferred by CVPS through a combination of alternative measures, including demand-side measures. Hahn pf. at 23; Kirby/Jones pf. at 11.

217. The consequences of failure (i.e., that the EE NTAs will not be implemented, or will not effectively serve as a reliable alternative to a new transmission line) are relatively low in deferring this element of the transmission upgrade, as any outages, although important, will only affect a limited geographic area within Vermont. Hahn pf. at 23.

(ii) NTAs Studied for the Regional System Problems

218. VELCO contracted with La Capra to evaluate NTAs. LaForest/Diebold pf. at 47; exh. Petitioners RSH-2.

219. La Capra examined a broad set of potential NTAs to the Coolidge Connector component of the Southern Loop Project, including EE, DR, new generation resources, and various combinations thereof. LaForest/Diebold pf. at 48.

220. Four Alternative Resources Configurations, or "ARCs," have been identified as potential alternatives to the Project:

ARC 1: Achievable EE and DR, plus three new 25 MW combustion turbine ("CT") units;

ARC 2: Eight new 25 MW CT units;

ARC 3: Achievable EE plus three new 25 MW CT units (installed earlier than assumed in ARC 1);

ARC 4: Achievable EE and DR, plus three new 25 MW wood-fired biomass units.

Exh. Petitioners RSH-2 at 1.

221. ARC 1 and ARC 4 are identical except for the type of new generation installed. ARC 1 includes three 25 MW CTs, while ARC 4 included three 25 MW biomass plants. *Id.*

222. An "all EE" ARC is not feasible, as there is insufficient EE potential to address the regional reliability need. Hahn pf. at 9; tr. 10/29/08 at 52-53 (Hahn).

223. The amount of EE that is available to serve as an NTA was estimated by Optimal Energy. This was done by first estimating the achievable potential for EE in the Northwest and Central zones, and subtracting out a projection of EE that is already likely to be implemented without regard for specifically geographically targeting NTAs in the Northwest and Central load zones. The resulting analysis identified an additional 43 MW of EE savings in the year 2016. Hahn pf. at 10–11.

(iii) "Smart-grid" Alternatives

224. "Smart grid" technologies do not provide a viable alternative to the proposed Project. LaForest/Diebold/Hahn reb. pf. at 27, 29; Smith reb. pf. at 1, 7; findings 225–235, below.

225. The Town of Dummerston's witness, Kurt Yeager, proposed six smart-grid "solutions" as alternatives to the Southern Loop Project, which he contended could increase the capacity of the Vernon-to-Cavendish line by an estimated 30 to 50 percent while reducing the power demand on the Coolidge Connector and eliminating the need for new power lines, as well as eliminating the security vulnerabilities in the electric grid. Yeager pf. at 7.

226. Mr. Yeager's smart-grid recommendations include:

- (a) Employing Flexible AC Transmission System ("FACTS") to digitally control the power delivery network;
- (b) Integrating smart sensors and communications technology for real-time power and information exchange;
- (c) Installing advanced metering infrastructure ("AMI") to create a two-way energy/information portal;
- (d) Integrating distributed energy resources;
- (e) Accelerating end-use efficiency through advances in digital electric technology; and

- (f) Reconductoring the existing Vernon-to-Cavendish line to ease thermal and voltage constraints.

Yeager pf. at 7.

227. VELCO has already accounted for the impact and potential use of these measures to resolve Vermont's reliability concerns, and Mr. Yeager's recommendations are wholly inadequate to address the potential of a widespread system blackout that the Project is designed to prevent. LaForest/Diebold/Hahn reb. pf. at 27, 29.

228. Reconductoring the existing 340 Line with a higher-capacity conductor will do nothing to improve power-system performance because *loss* of the transmission line itself is the fundamental contingency of concern facing Vermont and the neighboring states. *Id.* at 28; Smith reb. pf. at 2.

229. VELCO already employs a number of the technologies Mr. Yeager advocates. VELCO installed one of the first U.S., utility-based FACTS devices (a +/-75 MVAR STATCOM) at its Essex substation to defer transmission upgrades. LaForest/Diebold/Hahn reb. pf. at 29.

230. VELCO has employed the use of phase shifting transformers ("PSTs") for decades — the Plattsburg Phase Angle Regulating Transformer ("PAR"), the Sandbar PAR, the Blissville and Granite PSTs — to defer the construction of added transmission. *Id.*

231. Mr. Yeager has offered no specifics as to the location, size, type or cost of the FACTS devices that he proposes. In fact, the Petitioners and the Department investigated employing such a device at Coolidge as one of the alternatives to the Project, but the device would not provide a long-term remedy, because the sudden loss of real power simply cannot be made up by providing reactive compensation or voltage support. Smith reb. pf. at 3-4.

232. VELCO has already installed a fiber-optic communications network along its transmission footprint. The network is used to gather information on system conditions, display that information on the Supervisory Control and Data Acquisition (SCADA) system in VELCO's control center for assessment and control purposes, and coordinate digital relaying responses to fault events. The existing relaying and fault-interrupting infrastructure on the Vernon-to-Coolidge 345 kV line can remove the faulted line in no more than 67 milliseconds. (Response times for modern FACTS devices are not much better, often ranging in the 15 to 50 millisecond range.) Even if the existing Vernon-to-Coolidge 345 kV line could be interrupted

instantaneously, this would do nothing to address the underlying reliability problem, nor the associated equipment at risk. *Id.* at 29-30; LaForest/Diebold/Hahn reb. pf. at 30.

233. Sensors and real-time monitoring do not allow the system to correct itself for and anticipate potential instabilities. While redirection of flows post-contingency is possible, there is simply not enough capacity in the remaining ties to make up the loss of the 340 Line. Moreover, practical application of the software required to achieve centralized computer-based control requires at least 5 to 10 years of further research and development. Smith reb. pf. at 5.

234. With respect to Mr. Yeager's recommendation to install AMI, although the use of demand-side price signals as a tool for managing peak load has promise, its impact on transmission reliability will need significant analysis and review to determine its effectiveness after implementation within Vermont. AMI efforts are underway in Vermont, but deployment may be years away. As such, it is not a solution to the reliability issues addressed by the Southern Loop Project. LaForest/Diebold/Hahn reb. pf. at 31.

235. Nor can integrated distributed energy resources resolve the immediate reliability concerns for the loss of the 340 Line or loss of the Vermont Yankee 345/115 kV transformer, due to the costs, societal adjustment, and implementation lead-time associated with such distributed resources. *Id.*

Discussion

Smart-grid technologies would not provide a viable alternative to the proposed Project. Mr. Yeager contended that his proposals could increase the capacity of the existing Vernon-to-Cavendish line by an estimated 30 to 50 percent, while reducing the power demand on the Coolidge Connector and eliminating the need for new power lines, as well as eliminating the security vulnerabilities in the electric grid. However, the fundamental reliability problem facing Vermont and the neighboring states relates to a contingency involving the loss of the 340 Line. Using smart-grid technology simply to increase the capacity of the existing Vernon-to-Cavendish line "does nothing to help the situation when this line is lost as a contingency."⁶ Furthermore, Mr. Yeager did not provide specific proposals for the deployment of smart-grid technologies, and

6. Smith reb. pf. at 2.

the evidentiary record demonstrates that the application of such technologies would not solve the specific reliability problems facing VELCO and CVPS.

We are fully committed to investigating the usefulness of smart-grid technologies for Vermont's electric utilities, and we expect the utilities to carefully consider these technologies for deployment wherever appropriate. However, for the reasons set forth in the findings above, smart-grid technologies cannot resolve the particular reliability problems at issue here.

(iv) Cost-Effectiveness of the ARCs

236. The ARCs were evaluated according to several standards for cost-effectiveness: capital costs both with and without consideration of PTF rate treatment; relative rate impacts; societal costs; and system costs. Exh. Petitioners RSH-2 at 2–3, 40–41.

237. Associated with each ARC's economic outcomes are different capital requirements and rate impacts. The Coolidge Connector component of the Southern Loop Project (the Transmission Alternative, or "TA") has the lowest capital costs to Vermont: approximately \$13 million assuming PTF rate treatment as compared to ARC 1 at \$517 million, ARC 2 at \$359 million, ARC 3 at \$500 million, and ARC 4 at \$735 million. Hahn pf. at 15–16; exh. Petitioners RSH-2 at 3.

238. The TA also yields the lowest average retail rates. ARC 4 would produce the highest rates. Hahn pf. at 16.

239. The societal-test comparison included externalities and a risk adjustment for DSM, but does not include benefits from PTF rate treatment, Production Tax Credits ("PTCs"), Renewable Energy Certificate ("REC") revenues, or Forward Capacity Market ("FCM") revenues. Exh. Petitioners RSH-2 at 2–3, 40–41.

240. From the perspective of the societal test, ARC 1 has the lowest net present value ("NPV") societal costs, followed very closely by ARC 3 and then the TA followed closely by ARC 4. ARC 2 has the highest societal costs. Hahn pf. at 15–16.

241. The system-costs comparison included societal costs, PTF rate treatment, REC revenues, and FCM revenues. System costs were calculated both with and without PTCs. Exh. Petitioners RSH-2 at 2–3.

242. Assuming wood-fired biomass units continue to receive a production tax credit ("PTC") currently available to renewable energy projects over the life of these assets, REC revenues, PTF rate treatment for the Coolidge Connector, and FCM market revenues for new generation and DSM, ARC 3 has the lowest net present value ("NPV") of system costs. Hahn pf. at 15–16.

243. ARC 1 has the next lowest system costs, followed by the TA. These three alternatives yield NPV of system costs that differ by approximately \$60 million, or 6% of the total costs. Without the PTC but with PTF rate treatment and FCM revenues, ARC 3 has the lowest NPV of costs, followed by ARC 1, and then the TA. Without PTCs, the differences in the NPVs of system costs narrow slightly. *Id.* at 16.

244. ARC 2, the all-CT solution, has higher societal and system costs than the TA, but has the second-lowest capital costs. *Id.*

245. No single combination of options ranks consistently superior (i.e., lowest cost) under the various cost analyses. For example, the transmission alternative has the lowest capital requirements and rate impacts, but only the third lowest NPV societal costs. *Id.* at 19.

246. ARC 1 has low societal costs, but very high capital requirements and rate impacts. *Id.*

247. In addition to evaluating the comparative cost-effectiveness of the alternatives, LaCapra evaluated the feasibility of the alternatives. *Id.* at 20; exh. Petitioners RSH-2, Appendix F.

248. The reliability concerns being addressed by VELCO are primarily driven by load levels, particularly in the Northwest and Central load zones. LaCapra used a critical load level of 1155 MW in developing the ARCs, as this was previously the target load level for Project need at the time the petition was submitted in this proceeding in November, 2007. *See* Hahn pf. at 4.

249. More recent system studies (including the studies conducted for the Department) show that this target load level has dropped dramatically, to an estimated 945 MW. Smith pf. at 14.

250. The reduction in target load level means that even more energy efficiency or generation would be needed to meet the system needs, on a rough order of magnitude costing about \$200 million more than reflected in the NTAs that were analyzed. Tr. 10/29/08 at 42 (Hahn).

251. The development, construction, and operation of energy resources, including transmission, EE and DR, is difficult, and the selection of each resource within one or more ARCs carries some implementation risks. *Id.*

252. Prudent utility planning requires that such risks be assessed and factored into any conclusions that might be drawn from this analysis and any implementation strategy that might result. Hahn pf. at 24-25.

253. The transmission alternative involves some permitting risk, but once built, transmission lines present little operating risk, and are subject to outages primarily due to trees and storm events that can be managed with proper right-of-way maintenance. *Id.* at 25.

254. The transmission alternative proposed here utilizes an existing right of way, which removes significant implementation barriers. *See id.*

255. Generation options also present permitting and siting risk, and present additional operating and cost risk over their lives. *Id.*

256. Some generation options, such as biomass plants, have potential for benefits from the ISO-NE energy markets, but these benefits are affected by the price of wood fuel. *Id.*

257. The risks associated with implementing individual EE measures and programs are generally low, but there is uncertainty regarding the long-term sustainability of the required budgetary commitments, particularly at the levels assumed in ARC 1. *Id.*

258. The Achievable EE scenario calls for utility expenditure of \$594 million over the next ten years, 100% more than currently budgeted for Efficiency Vermont, thus requiring a substantial, long-term increase in state-wide EE budgets. The approval of such an aggressive budget is uncertain over the extended period of time needed for full implementation and realization of the requisite EE. *Id.* at 25–26.

259. No utility has ever sustained such large distributed resource commitments for so long in so many markets simultaneously and actually achieved the relative magnitudes of peak demand savings projected over the next decade as indicated in this report. *Id.*; Kleinman pf. at 8.

(c) Technical Effectiveness of the Alternatives

260. VELCO has also analyzed the technical effectiveness of implementing the ARCs in an effort to evaluate their ability to meet system reliability criteria while comparing system performance to that of the Project. LaForest/Diebold pf. at 47.

261. ARC 1 failed to perform acceptably, as the system generally overloaded one or both of the typically limiting transmission corridors identified in the analysis (one in New York and another in Vermont) and/or failed to meet the post-contingency voltage criterion. *Id.* at 49-50; exh. Petitioners DLL/CD-8.

262. The ARCs that did perform acceptably only met the criteria minimally with respect to voltage criterion and are typically within one to ten percent of maximum allowed post-contingency thermal ratings on the critical circuits. LaForest/Diebold pf. at 49.

263. Given this result, the set of ARCs and a few sensitivity ARCs (i.e., versions of ARC 1 with additional/front-loaded generation) were considered. Only those ARCs with an added generation component performed acceptably. *Id.* at 50.

264. The generation components of the various ARCs also have a geographic limitation, in that generation sited in central Vermont close to the northern end of the existing Vermont Yankee-to-Coolidge 345 kV line performed better than generation sited further away in northwestern Vermont. *Id.*

265. In summary, the ARCs perform better with a well-placed generation component due to the ability of the generation to provide reactive support, and resulting voltage support, in addition to displacing real power. *Id.* at 53.

266. The transmission alternative performs best due to its inherent robustness. This is demonstrated by the difference in post-contingency loading on the transmission system seen with the Project and in the post-contingency voltage profile also seen with the Project in-service. *Id.*

267. The system with the Project transmission upgrades, for the load levels examined, did not load any transmission corridor to within 10% of its maximum post-contingency thermal limit, while the NTA ARCs commonly did so to multiple transmission circuits. *Id.*

268. The system with the Project has a post-contingency voltage profile (after loss of the existing 340 Line or proposed 360 Line) that can accommodate unanticipated changes in presumed reactive resources to meet ongoing power factor needs; the tested ARCs could not accommodate those reactive resource changes without consequent resource additions in the ARC. *Id.*

269. To help bridge reliability until the Project can be placed into service, CVPS has sought and acquired 25 MW of OP 4 demand response until the Southern Loop Project can be built. Exh. CVPS Cater-Bentley-1; tr. 11/6/08 at 176-77 (Bentley).

Discussion

As this Board observed in its order approving VELCO's NRP: "Vermont needs a bulk transmission system that very rarely fails, because our society has become increasingly dependent on the electric grid."⁷ Furthermore, national and regional reliability standards call for VELCO, as an owner and operator of bulk power transmission facilities, to plan and implement upgrades that allow the system to withstand a range of contingencies while reliably serving customer demand and preventing identified outages, and that can accommodate a broad range of system conditions over a planning horizon. VELCO and CVPS also have an obligation pursuant to Vermont law to provide reliable and adequate electric service to Vermont.⁸

The regional need for this Project was identified in the Critical Load Study prepared by VELCO for the NRP, in which VELCO reported that an outage of the PV-20 115 kV transmission tie, in conjunction with loss of the Vernon-to-Coolidge 345 kV line, would result in voltage collapse at a 1165 MW load level (with NRP upgrades in service). This scenario was also identified in the VELCO 2006 Long Range Transmission Plan Analysis as the most significant problem on the system. Since the approval of the last large transmission upgrade (the NRP approved in January 2005), Vermont's and New England's summer peak loads have continued to grow while regional reliability standards become further defined (with mandatory compliance with NERC and NPCC planning standards).

The Southern Loop Project will address both the local and regional system deficiencies, and bring VELCO into compliance with the new federal Reliability Standards as well as similar regional Reliability Standards that apply to the bulk power system. First, with the completion of a second Vernon-to-Cavendish 345 kV line, loss of one 345 kV line in the corridor still leaves the other to perform the necessary network function. Second, the Project will result in a new

7. In re: Northwest Vt. Reliability Project, Docket No. 6860, Order of 1/28/05 at 8.

8. See, In re: Northwest Vt. Reliability Project, Docket No. 6860 Order of 1/28/05 at 9 (citing 30 V.S.A. § 219).

substation in Vernon, just north of the Vermont Yankee substation, which will address breaker-failure contingencies by removing key elements of the local power system from adjacent breaker positions within the new Vernon substation. Finally, a second 345/115 kV autotransformer will be installed in this new substation, removing the local load reliability susceptibility for loss of the sole Vermont Yankee 345/115 kV autotransformer.

The Project addresses the local CVPS reliability problem in southern Vermont by including a new injection point into the Southern Loop (the Vernon-to-Newfane portion of the Coolidge Connector 345 kV line, the new Newfane 345/115/46 kV substation and one-mile 345 kV loop line between the Newfane substation, and the new Vernon-to-Coolidge 345 kV line).

We also find that the Project is the most effective, and cost-effective, solution to the existing reliability problems. No party filed a brief opposing the Project, and only one party – the Town of Dummerston – presented testimony contending that there was a better alternative for addressing the reliability problems that the Project is designed to correct. Dummerston's witness, Kurt Yeager, proposed smart-grid technologies as alternatives to the Project. For the reasons that we previously stated, application of smart-grid technologies would not solve the specific reliability problems facing VELCO and CVPS.

Turning to other possible alternatives to the proposed Project, including alternatives with more aggressive energy efficiency and new generation in Vermont, none have lower capital costs to Vermont or result in lower average retail rates than the Coolidge Connector component of the Southern Loop Project. While the societal costs of an energy efficiency scenario may be lower over the life of the Coolidge Connector, our determination of cost-effectiveness should not be limited to one parameter. As we concluded in our order in Docket No. 7081 (*Investigation Into Least-Cost Integrated Resource Planning for Vermont Electric Power Company Inc.'s Transmission System*), the relative rate and bill impacts of the alternatives, the financial feasibility of each alternative, the ability of each alternative to be implemented in a timely manner to address the reliability deficiency, and relative economic benefits to the state, are all economic considerations that we must evaluate.⁹

9. Docket No. 7081, Order of 6/20/07 at 21–22, 32.

The achievable energy efficiency scenario studied would call for efficiency expenditures of at least \$594 million over the next ten years, significantly more than currently budgeted for Efficiency Vermont. (In fact, this figure underestimates the required efficiency expenditure by approximately \$200 million, due to the lower target load level for the Project.¹⁰) This would require a substantial, long-term increase in state-wide energy efficiency budgets. In addition, as Optimal Energy noted in its analysis of potential energy efficiency resources for this Project: "An important source of uncertainty, however, is the fact that no utility has ever sustained such large distributed resource commitments for so long in so many markets simultaneously and actually achieved the relative magnitudes of peak demand savings projected over the next decade"¹¹ Moreover, in order to meet minimum reliability criteria for the Coolidge Connector, an energy efficiency solution would need to be supplemented with additional generation.

It should be recognized that the Project does incorporate plans for energy efficiency and customer-sited distributed generation in order to defer a potential 115 kV Project component in Southern Vermont. However, the remainder of the Project cannot be deferred by non-transmission alternatives, and is the most cost-effective solution among potentially available transmission alternatives to solve the severe reliability exposures faced by both the regional and local system networks. We note that on the regional level, this Project need is driven by load and system topology not only in Vermont, but extending into New York, New Hampshire and the remainder of New England as well. A regional solution, as proposed by Petitioners and supported by ISO-NE, with costs shared by the broader region, is an appropriate, equitable and cost-effective solution to these regional issues.

We also recognize that, in comparison to the NTAs, the proposed Project would result in a more robust system, one with better performance in post-contingency loading on the transmission system and in post-contingency voltage profile. Also, unlike the NTAs, the Project can accommodate unanticipated changes in reactive resources without added resources.

In addition to improving the reliability of the Vermont transmission system, the stronger, more stable transmission system resulting from the Project will provide a more robust framework

10. See Finding 250, above.

11. Hahn pf. at 26.

for generation in Vermont, as well as providing this area access to generation from elsewhere in Vermont and New England. This will reduce congestion that results from operational reliability constraints and improved efficiency with reduced system losses. The added transmission strength afforded by the Project will result in added stability and power quality benefits, particularly through redundancy of the second 345 kV line from Vernon to Coolidge.

F. System Stability and Reliability [30 V.S.A. § 248(b)(3)]

270. The Project will not adversely affect system stability and reliability; in fact, the Project will enhance system stability and reliability. This finding is supported by the findings in Section IIE, above, and findings 271 through 283, below.

271. The southern Vermont transmission system is reaching its capability to reliably supply peak demand. At present-day load levels and system configuration, and in the interim before transmission reinforcements may be implemented, the transmission system is vulnerable to voltage sags, thermal overloads, loss of customer load, and possibly widespread voltage collapse. Smith pf. at 4; Kowalski pf. at 11.

272. System planning studies demonstrate that the reliability of the regional bulk power transmission system that connects southern Vermont, southwestern New Hampshire, north central Massachusetts and eastern New York is at risk of voltage collapse, or blackouts, even at summer demand levels which are less than existing summer peak demand levels. Exh. Stipulation 2 at 2; Kowalski pf. at 11; findings 112 through 139, above.

273. These system conditions and potential failures violate regional and national reliability criteria. If the loss of the existing 340 Line leads to unintentional cascading of outages in other states, VELCO could potentially be subject to NERC fines. LaForest/Diebold/Hahn reb. pf. at 7.

274. In addition to the regional problems, electrical facilities in Southern Vermont owned by CVPS have limited ability to support increased electrical demand and are unable to withstand failures of, or to have preventative maintenance conducted on, key components at present demand levels. LaForest pf. at 10; exh. Stipulation 2 at 2-3.

275. CVPS's sub-transmission load in southern Vermont is served by a 66-mile, 46 kV sub-transmission line that runs from Brattleboro and Bennington. The CVPS system reliability

problem stretches from southwestern to southeastern Vermont, covering the areas from Brattleboro-Stratton and Stratton-Bennington and potentially impacts 40,000 customers. During sixty percent of the hours in the year the loss of certain individual line segments or other equipment could result in a power outage to some or all of the customers in this load area of southern Vermont. Exh. Stipulation 2 at 2-3.

276. The Project's subtransmission elements, which provide the Newfane Substation interconnection to CVPS 46 kV subtransmission loop, will not adversely affect system stability and reliability because its essential purpose is to improve system stability and reliability. The CVPS Southern Loop subtransmission system and Brattleboro area system have an existing exposure to unreliable operation that is unacceptable. Jones/Kirby pf. at 27-28.

277. In addition to improving the reliability of the Vermont transmission system, the stronger, more stable transmission system resulting from the Project will provide a more robust framework for Vermont generation sources to connect into the transmission system, as well as providing this area access to generation from elsewhere in Vermont and New England. This will reduce congestion that results from operational reliability constraints. Smith pf. at 19-20.

278. There is also concern that local generating units may not be available when needed, given the natural occurrences of unexpected outages, limited hydro-electric plant capability in the summer, the age and nature of several units and the possibility of permanent shut down due to either catastrophic failure or owner retirement. The problems in providing electricity worsen if local supplies of electricity are unavailable. The proposed Project will allow for a reliable transmission system to be in place to import electricity into and around the southern region of Vermont. Kowalski pf. at 10-11.

279. The added transmission strength afforded by the Project will result in added stability and power quality benefits, particularly through redundancy of the added 345 kV line from Vernon to Coolidge. The presence of a second line substantially reduces the shock to the system caused by electrical faults on either line and subsequent loss of that line. The presence of the second line from Vernon to Coolidge will also provide additional operational flexibility and provide enhanced windows of opportunity to perform system maintenance. Smith pf. at 20.

280. The proposed Project will enhance stability of the system in several ways. Voltage stability will be improved due to the added stiffness provided by the 345 kV line addition from Vernon to Coolidge. Angular stability of interconnected Vermont generators will be enhanced by the added stiffness afforded by the 345 kV addition. The added voltage stability will also reduce reactive demands on local generation during contingency conditions, thereby reducing the chances of their tripping during severe contingencies. In addition, the added stiffness will provide enhanced power quality for Vermont customers connected to the system. *Id.* at 29.

281. Additionally, the installation of the Vernon Substation should eliminate the problematic multi-element contingencies that involve the loss of the existing 340 Line. Adding a second autotransformer at Vernon would alleviate the vulnerability of southern Vermont load to a long-term outage of the existing Vermont Yankee autotransformer. Kowalski pf. at 12.

282. The NEPOOL Reliability Committee has determined that the proposed Project will have no adverse impact on regional system reliability or stability.¹² Smith pf. at 29.

283. The Project is needed to address these regional and local reliability deficiencies, to provide Vermonters with reliable and adequate electric service. The proposed Project will not adversely affect system reliability and stability, but rather would enhance system stability and reliability. Exh. Stipulation 2 at 3.

G. Economic Benefit to the State [30 V.S.A. § 248(b)(4)]

284. The Project will result in economic and social benefits to the state of Vermont and its residents. This finding is supported by findings 285 through 297, below.

285. The Southern Loop Project is needed to correct system deficiencies that expose Vermont, as well as portions of New York and New Hampshire, to transmission-system failures that could result in widespread blackouts. LaForest/Diebold/Hahn reb. pf. at 3.

286. These system conditions and failures could have severe adverse economic consequences for Vermont and neighboring states impacted by such failures. *Id.*

12. Documented in a memo from the Secretary of the NEPOOL Reliability Committee to the NEPOOL Participants Committee, titled "Actions of the Reliability Committee," dated May 22, 2008.

287. Improved reliability in the bulk power system in Vermont increases public safety and convenience while simultaneously reducing Vermont's exposure to outages which could potentially have large economic impacts on Vermont. LaForest pf. at 9-10; LaForest/Diebold/Hahn reb. pf. at 3-4; *see* In re: Northwest Vt. Reliability Project, Docket No. 6860, Order of 1/28/05 at 181.

288. Power reliability and power quality can have significant impacts on businesses, particularly as we shift to a digital society. LaForest/Diebold/Hahn reb. pf. at 4.

289. Some appliances will not run below a specified voltage level, and prolonged operation at reduced voltage can prematurely age or damage an appliance. High voltage may damage equipment, such as computers, light bulbs, and televisions. Large voltage changes, a phenomenon that occurs on weaker transmission systems, can be noticeable to individuals and especially to sensitive equipment, such as computers and certain manufacturing machinery. *Id.* at 17-18.

290. These voltage changes can affect manufacturing processes and result in significant financial loss. The impact of even momentary power disturbances can be quite severe in technology manufacturing facilities, such as IBM's. Poor voltage performance can result in significant production and financial losses. *Id.* at 18; *see* exh. Petitioners DLL/CD-17.

291. While the 2003 Blackout did not cause IBM's semiconductor manufacturing business operations in Vermont to "go off the grid," the low voltages experienced during the Blackout caused numerous systems and equipment to shut off. Exh. Petitioners DLL/CD-7 at 1.

292. The result was that IBM lost a full day of production, was forced to scrap hundreds of partially completed wafers which were damaged, was required to repair thousands of wafers, and needed approximately \$500,000 in spare parts in order to re-start and re-qualify the systems. Total losses from this single event were in the millions of dollars. *Id.*

293. The reliability of electric power, and the quality of electrical power are very important to technology manufacturers like IBM. *Id.* at 2.

294. As more and more businesses and homes make more use of sensitive electric equipment, the need for high levels of reliability and power quality will increase. *Id.* at 3.

295. EPRI studies have reported that across all business sectors, the U.S. economy is losing between \$104 billion and \$164 billion a year due to outages, and even a one-second power disruption can cost some firms in the thousands of dollars. *Id.*; exh. Petitioners Reb. LDH-1, at ES-3.

296. Based upon industry information and analyses contained in a report, Cost of Power Interruptions to Electricity Consumers in the United States (U.S.), published by the Ernest Orlando Lawrence Berkeley National Laboratory published in February of 2006, the potential cost of a three-hour outage of the 340 Line (the single worst outage that would be resolved by the Project) would be approximately \$254 million (in 2008 dollars). Exh. Stipulation 5 at para. 8 and attachments.

297. The CVPS Southern Loop subtransmission system and Brattleboro area system have an existing exposure to unreliable operation that is unacceptable. Many of the customers in this area are businesses that depend on reliable service for continued profitability and employment. By remediating this undue exposure to reliability problems, the Project would help to maintain this commerce and support its possible expansion, thereby providing a tangible economic benefit to the state and its residents. Jones/Kirby pf. at 28.

Discussion

Pursuant to 30 V.S.A. § 248(b)(4), the Board must find that the proposed Project "will result in an economic benefit to the state and its residents" before issuing a certificate of public good.

We conclude that the proposed Project will result in an economic benefit to the state and its residents. It is clear that the status quo presents unacceptable risks of outages in Vermont. Our findings and conclusions from Docket No. 6860 (the NRP proceeding), are on point. There we observed:

The evidence demonstrates that the proposed Project is needed to assure Vermont that electric power can be reliably provided now and in the near future, up to load levels of approximately 1,200 MW. The proposed Project would thus reduce the possibility of potentially serious economic consequences caused by wide-spread loss of power in northwest Vermont (which could cascade to wider areas of the state, as well). Such economic consequences would include, but are not limited

to, the cost of lost production at manufacturing facilities and other energy-dependent businesses. A more reliable bulk power system could enhance businesses' perceptions of Vermont as a place to locate or expand existing facilities. If businesses perceive Vermont's infrastructure to be more reliable than other states in the Northeast, Vermont will be at a competitive advantage in attracting new businesses to Vermont or convincing existing companies to expand here. Conversely, if businesses perceive the infrastructure to be less reliable than other states as a result of doing nothing to address current signs of deficiencies, then Vermont could be at a serious competitive disadvantage.¹³

In this case, the evidence demonstrates that existing system deficiencies expose 1000 MW of Vermont load, representing nearly the entire state, as well as significant portions of New Hampshire and New York load, to potential voltage collapse and cascading outages, at load levels below existing summer peak loads. That is, the timing, scope and potential severity of the reliability problems presented in this case are even more severe than those presented with respect to the NRP. Our rationale and conclusions apply equally, if not with more force, here.

Furthermore, for us to reach this conclusion a specific quantification of the economic costs of inaction is not necessary, especially in light of the significant and pressing reliability problems that the proposed Project addresses. As we observed in Docket No. 6860:

Some considerations do not readily lend themselves to an easily quantifiable cost analysis. Furthermore, there is no requirement under the statute limiting our analysis [under Section 248(b)(4)] strictly to those economic benefits that are readily quantifiable. Doing nothing to address reliability in a system that is already experiencing deficiencies is neither sound regulatory policy, nor likely to lead to anything but negative economic consequences.¹⁴

We conclude that the proposed Southern Loop Project will provide an economic benefit to the residents of the state of Vermont.

H. Aesthetics, Historic Sites and Water Purity, the Natural Environment and Public Health and Safety [30 V.S.A. § 248(b)(5)]

298. The Project will not have an undue adverse effect on aesthetics, historic sites and water purity, the natural environment, and the public health and safety. This finding is supported by

13. In re: Northwest Vt. Reliability Project, Docket No. 6860, Order of 1/28/05 at 183.

14. *Id.* at 184.

findings 299 through 539, below, which give due consideration to the criteria specified in 10 V.S.A. §§ 1424a(d) and 6086(a)(1) through (8) and (9)(K).

(1) Public Health and Safety [30 V.S.A. § 248(b)(5)]

Electromagnetic Fields ("EMF")

299. The electric and magnetic fields produced by the proposed Project will not have an undue adverse effect on the public health or safety. This finding is supported by findings 300 through 308, below.

300. EMF has two components, an electric field and a magnetic field. The electric field is a measure of force-per-unit-charge and is usually expressed in units of volts per meter (V/m). The magnetic field is a measure of the force-per-unit-length-of-wire per unit current and is usually expressed in units of milligauss (mG). The size of the magnetic field is proportional to the current, and the size of the electric field is proportional to the voltage. Valberg pf. at 6 and 8.

301. EMFs are produced by high voltage transmission lines, distribution lines, wiring in buildings, and many commonly used appliances. Magnetic power frequency fields close to electrical appliances are often much stronger than those from other sources, including power lines. Exposures vary widely from refrigerators (up to 10 mG at 6 inches) to can openers (up to 1500 mG at 6 inches). Typical magnetic power frequency fields in the home average 0.9 mG and range from 0.1 to 4 mG over a period of a day. Average electric power frequency fields in the home range from 0 to 0.01 kV/m. Exh. DPS-VPH-2 at 15.

302. There are currently no federal standards for occupational and residential chronic exposures to EMF, nor are there standards or guidelines limiting EMF fields for appliance manufacturers. Valberg pf. at 28; exh. DPS-VPH-2 at 13.

303. The International Commission on Non-Ionizing Radiation Protection ("ICNIRP") has established guidelines for acute exposure of the public to magnetic and electric power frequency fields of 833 mG and 4.2 kV/m, respectively. The State of Florida has established guidelines for power lines less than 230 kV of 150 mG and 2.0 kV/m at the edge of the right-of-way, and 8.0 kV/m in the right-of-way when the power line is operating at its highest continuous current rating. The Florida guidelines are non-health based, and instead are designed so that the

maximum EMF will not exceed those fields produced by power lines now in operation. Exh. DPS-VPH-2 at 14-15, and 37.

304. The National Institute of Environmental Health Sciences ("NIEHS") had a program called "EMF RAPID" that funded laboratory research to determine what, if any, aspects of EMF interaction with biological systems have the potential to express themselves as adverse disease outcomes. The NIEHS has concluded that:

the probability that ELF-EMF exposure is truly a health hazard is currently small. The weak epidemiological associations and lack of any laboratory support for these associations provide only marginal, scientific support that exposure to this agent is causing any degree of harm.

Valberg pf. at 12.

305. The magnetic power frequency field for average and annual peak loading at the edge of the right-of-way is projected to be less than 29 mG along the Project corridor. The magnetic power frequency field for average and annual peak loading directly under the power line is projected to be less than 139 mG along the Project corridor. Exh. DPS-VPH-2 at 56.

306. The electric power frequency fields at the edge of the right-of-way are projected to be less than 1.6 kV/m along the Project corridor. The electric power frequency fields directly under the power line are projected to be between 6.8 to 8.5 kV/m along the Project corridor, which is approximately the same as the existing electric power frequency fields of 6.4 to 6.7 kV/m. Exh. DPS-VPH-2 at 56.

307. An existing residential building near pole 142, on Merrill Drive, lies in the Newfane to Coolidge portion of the Southern Loop right-of-way. It extends into the right-of-way by approximately 30 feet from the west. The magnetic power frequency field for average and annual peak loading directly under the power line is projected to be no greater than 38 mG at the existing building. The projected electric power frequency fields directly under the power line are projected to be 3.41 kV/m at the existing building. Exh. DPS-VPH-2 at 48.

308. Exposure to EMF can be reduced in a number of ways. The easiest method is by increasing distance away from the power lines, since the EMF strength decreases rapidly with distance from the source. Other methods for reducing exposure include: (1) spending less time near the source to reduce cumulative exposure; (2) placing power lines underground; and (3)

moving the phase conductors on a transmission line closer together. Valberg pf. at 8; exh. DPS-VPH-2 at 13, 14, and 18.

Discussion

In its review of the Northwest Vermont Reliability Project in Docket No. 6860, the Board found that:

the electric and magnetic fields ("EMF") that will result from the proposed Project are very unlikely to have an undue adverse effect on public health. It is not possible to state unequivocally that there will be no adverse health effects. Some epidemiological studies have found a weak correlation between EMF and childhood leukemia, despite the fact that no mechanism of causation has been found.¹⁵

The Board specifically declined to set standards for EMF exposure or adopt the guidelines established by other states, and instead adopted a policy of prudent avoidance. The Board explained prudent avoidance, as follows:

[A]doption of policies that limit magnetic field exposure whenever this can be done for a small investment of money and effort. Prudent avoidance argues that a sufficient basis for concern does exist but not enough is presently known to justify large investments for avoiding magnetic field exposure. Under this approach, large expenditures would not be made until research provides a clearer picture of the existence and magnitude of the risks involved.¹⁶

The Board further examined what would constitute low-cost investment with respect to prudent avoidance and found some general guidance from a decision by the California Public Utilities Commission. In response to the scientific uncertainty surrounding EMF, the California Public Utilities Commission required utilities to undertake low-cost mitigation measures. The California Commission defined "low-cost" as:

in the range of 4% of the total project cost but specified that this 4% benchmark is not an absolute cap. [The Commission] found that, to be implemented, a mitigation measure should achieve some noticeable reduction in EMF but declined to adopt a specific goal for EMF reduction.¹⁷

15. Docket No. 6860, Order of 1/28/05 at 62.

16. Docket No. 6860, Order of 1/28/05 at 74 citing the Department's 1994 Twenty-Year Electric Plan at 5–12.

17. 236 P.U.R. 4th 406 (Cal. P.U.C., August 19, 2004).

The Colorado Public Utilities Commission, in a 2003 order, describes mitigation techniques such as increasing line clearance and careful line configuration as falling within the parameters of prudent avoidance.

As the Board found in Docket No. 6860, the National Institute of Environmental Health Sciences does provide some specific guidance as to recommended regulatory action in response to current knowledge of EMF risk. "NIEHS suggests that the power industry continue its current practice of siting power lines to reduce exposures and continue to explore ways to reduce the creation of magnetic fields around transmission and distribution lines without creating new hazards."¹⁸ Consistent with this recommendation, in Docket No. 6860 and in Docket No. 7032¹⁹, the Board directed VELCO to identify areas of relatively high EMF levels expected at nearby residences and propose measures that might mitigate EMF exposure at these locations.

With regard to the proposed Project, the parties did not actively litigate any issues related to EMFs. During the public hearing, some commenters questioned whether EMF levels from the project would result in a health risk. In addition, there are few areas along the Vernon to Cavendish corridor where residences have been built near the existing right-of-way, with one residence in the right-of-way. Having carefully reviewed the EMF issues and related to the proposed Project, and consistent with our precedent, we will require VELCO, as part of the post-certification proceedings, to examine the feasibility of low-cost EMF mitigation at any nearby residences.

(2) Outstanding Resource Waters [10 V.S.A. § 1424a(d)]

309. No element of the Project will be located near any outstanding resource waters of the State as identified by the Vermont Water Resources Board, and therefore the Project will not have any impact on outstanding resource waters. Exh. Petitioners SD-2 at 6.

18. Docket No. 6860, Order of 1/28/05 at 75 (citing exh. VELCO Cross DelPizzo-8 at 37–38).

19. Docket No. 7032, Order of 3/16/06 at 30-31.

(3) Air Pollution [10 V.S.A. § 6086(a)(1)]

310. The Project will not result in any undue air pollution. This finding is supported by findings 311 through 327, below.

311. During construction, there will be minimal short-term impacts from construction equipment (e.g., diesel and gasoline-powered trucks and equipment). For tree clearing during construction, trees and brush will be chipped, not burned. Stamatov pf. at 11; Disorda pf. at 25.

312. Dust control, when necessary, will be accomplished through application of water or calcium chloride on construction access roads and other areas disturbed by construction. Stamatov pf. at 11.

313. CVPS will use vacuum-insulated 46 kV circuit breakers at the Newfane Substation, rather than sulfur hexafluoride ("SF6") insulated circuit breakers. The vacuum circuit breakers are similar to the ones being installed at the CVPS Kendall Farm Substation synchronous condenser project. Tr. 11/6/08 at 91-92 (Johnson).

314. VELCO will use SF6-insulated circuit breakers for the 115 kV and 345 kV voltage levels at the Coolidge, Vernon, and Newfane substations. Tr. 11/6/08 at 84-85 (Barrett).

315. The SF6-insulated circuit breakers proposed for the Project are manufactured by HVB AE Power Systems Inc. This manufacturer's operating manual for these circuit breakers indicates that the maximum design leakage of SF6 is one pound per square inch per year. The National Electrical Manufacturer's Association ("NEMA") management guideline is 5 percent leakage over a 50-year service life and the International Electrotechnical Commission ("IEC") standard for new equipment leakage is 0.5 percent per year. VELCO memorandum 12/16/08 at 1.

316. VELCO currently maintains 169 SF6-insulated circuit breakers. In 2008, VELCO added a total of 46.5 pounds of SF6 to its circuit breakers, equating to about 0.4 percent of the total volume of SF6 gas in its system. VELCO memorandum 12/16/08 at 1.

317. VELCO currently implements a leak-prevention program for its SF6 circuit breakers. Substations inspections are performed on a monthly basis, during which gas pressures are recorded and compared to both the normal fill pressure from the previous reading. If there is a variance of more than 4 psi, the breaker is scheduled for leak detection and repair. More thorough inspections are performed on a three-or-five year interval, depending on manufacturer

recommendation. These inspections include leak detection, electrical testing and mechanical adjustments. Additionally, VELCO has purchased a long wave infrared camera to visually detect leaks. VELCO memorandum 12/16/08 at 1.

318. All SF6 circuit breakers in the VELCO system are designed to activate an alarm when the gas level is low. Alarms are received in the Control Center and substation personnel are dispatched to verify gas pressure. If a leak is identified, an outage is scheduled to make repairs. However, low pressure may not necessarily mean that a gas leak has occurred since temperature changes result in pressure changes. Tr. 11/6/08 at 88 (Barrett); tr. 11/6/08 at 96-97 (Johnson); VELCO memorandum 12/16/08 at 1.

Discussion

VELCO has indicated that it currently implements a leak-prevention program for its SF6 circuit breakers. Under the current program if there is a variance of more than 4 psi, the circuit breaker is scheduled for leak detection and repair. For the circuit breakers proposed for the Project, the manufacturer's operating manual for these circuit breakers indicates that the maximum design leakage is one pound per square inch per year. It appears that VELCO's program of scheduling a leak detection for a 4 psi variance is inconsistent with the manufacturer's operating manual of one psi. However, it is our understanding that under actual operating conditions in the field normal fill pressures can appear to vary more than one psi on a regular basis due to temperature and load changes which cause volume changes in the SF6 gas. Therefore, small changes in psi readings can be due to temperature and load changes and are not necessarily a result of the loss of SF6. Monitoring at a 4 psi variance, VELCO is within NEMA and IEC leakage guidelines, as evidenced by the addition, in 2008, of about 0.4 percent of total volume of SF6 gas to VELCO's system.

VELCO also appears to be a member of SF6 Emission Reduction Partnership for Electric Power Systems, a collaborative effort between EPA and the electric power industry to reduce SF6 emissions. Although VELCO's testimony states that it is not a member of the EPA SF6

partnership,²⁰ an EPA report on the program indicates that Vermont Transco, LLC is a member of the program.²¹ VELCO should file a letter clarifying this inconsistency. The EPA program provides a framework for reporting and monitoring on SF6 use. VELCO's participation in the program and its SF6 recorded loss of 0.4 percent provides some assurance that SF6 emissions from VELCO's operations are being minimized.

Noise

319. The Project will not produce undue noise levels. This finding is supported by findings 320 through 327, below.

320. Any noise resulting from Project construction will result primarily from operation of construction equipment. Stamatov pf. at 11.

321. There are no federal or state noise standards that apply to the Project. Kaliski pf. at 4.

322. The World Health Organization's "Guidelines for Community Noise" suggests noise criteria based on the most recent scientific research on noise effects. The Guidelines, published in 1999, recommend a limit of 50 dBA, averaged over the day to protect against moderate annoyance, and 45 dBA, averaged over the night to protect against sleep disturbance. Kaliski pf. at 4-5.

323. The National Electrical Manufacturer's Association ("NEMA") publishes standards for noise emissions from new power transformers. These are codified in NEMA Standards Publication No. TR-1-1993 (R2000), Transformers, Regulators, and Reactors. The standards give maximum noise levels at a distance of 1 to 6 feet from a transformer under various cooling modes by transformer size. For example, the NEMA TR-1 standard at a distance of one foot for a 345 kv/115 kV transformer is no more than 90 dBA and for a 115 kV/46 kV transformer is no more than 77 dBA. Kaliski pf. at 6; exh. Petitioners KK-3.

324. Based on background sound monitoring and computer modeling, the noise that will be produced by the Project substations is expected to be below the guidelines and standards described above. Kaliski pf. at 6-10; exh. Petitioners KK-3.

20. Tr. 11/6/08 at 41-42 (LaForest).

21. See *SF6 Emission Reduction Partnership for Electric Power Systems, 2007 Annual Report*, U.S. Environmental Protection Agency, December 2008.

325. Corona noise is the primary component of noise emitted from transmission lines, and is greatest when conductors are wet or when lines are dirty after long dry periods. Kaliski pf. at 11.

326. For sound mitigation measures at the Project substations, the VELCO expert recommends the use of transformers that have sound emissions at least 10 dBA below NEMA TR-1 standards and the use of low-corona busbars and other equipment on the 345 kV yards to minimize corona noise. The VELCO expert also recommends post-construction noise monitoring to confirm that the transformers are operating according to their specifications. Kaliski pf. at 7, 9, and 11.

327. For sound mitigation measures for the transmission lines, the VELCO expert recommends the avoidance of the type of equipment that leads to corona noise such as angular metals and specifying the use of low-corona type insulators and similar equipment. Kaliski pf. at 11.

Discussion

The models prepared by the Petitioners indicate that the noise levels at the substations will not exceed any of the guidelines discussed above. Based upon this evidence, we find that the noise levels from the proposed Project upgrades will not be unduly adverse. We also concur with the VELCO expert with regard to the sound mitigation measures for the Project substations and transmission lines. For Project substations, we will require that new power transformers comply with sound emissions at least 10 dBA below National Electrical Manufacturer's Association TR-1 standards. We will also require that low-corona busbars and other equipment be used to minimize corona noise. In addition, post-construction noise monitoring shall be required to confirm that the transformers are operating according to their specifications. For the Project transmission lines, we will require the use of low-corona type insulators and similar equipment. We also will require that VELCO avoid the use of the type of equipment, such as angular metals, that leads to corona noise.

(4) Water Pollution [10 V.S.A. § 6086(a)(1)]

328. The Project will not cause undue water pollution. This finding is supported by findings 329 through 390, below.

(5) Headwaters [10 V.S.A. § 6086(a)(1)(A)]

329. The Project will meet all applicable health and environmental conservation regulations regarding reduction of the quality of the ground or surface waters flowing through or upon headwaters areas. This finding is supported by findings 330 through 334, below.

330. The Project substations are not located within a headwaters region of applicable watersheds. Exh. Petitioners SD-2 at 8.

331. Most of the identified headwaters within the Southern Loop Project study area are first-order streams with relatively low flow regimes. Exh. Petitioners SD-2 at 7 and Figure 2.

332. The Project activities that have the potential to affect headwater streams include tree clearing, and the limited ground disturbance associated with the construction of transmission pole structures, access roads, and the installation of conductors. Exh. Petitioners SD-2 at 8.

333. The Vernon-to-Cavendish 345 kV right-of-way crosses only one known tributary, Stickney Brook, that contributes to a water supply along the entire Project right-of-way. Stickney Brook, which is withdrawn for supply to Pleasant Valley Reservoir in Brattleboro, is not expected to be affected by project activities. Due to access constraints, the crossing of Stickney Brook or two small tributaries of the main stem may be necessary to construct the line. This crossing will be temporary in nature and will be performed with the use of a temporary bridge or construction mats. The crossing will be performed in accordance with site-specific stream crossing procedures developed in conformance with stream-protection mitigation practices outlined in VELCO's Stream Crossing Plan. Exh. Petitioners SD-2 at 8, 13, and Figure 1, sheet 12; exh. Petitioners JS-2.

334. The potential impacts of the Project upon ground and surface water quality on lands that may be considered headwaters will not be significant. With the implementation of the practices and standards outlined in VELCO's Stream Crossing Plan, its Transmission Vegetation Management Plan, its Environmental Guidance Manual and a project-specific Erosion

Prevention and Sediment Control ("EPSC ") plan, the Southern Loop Project will not have an undue adverse impact on the natural flow regime, the condition or water quality of headwater streams, or public health. Exh. Petitioners SD-2 at 8-9.

(6) Waste Disposal [10 V.S.A. § 6086(a)(1)(B)]

335. The Project will meet the applicable health and environmental Vermont Department of Environmental Conservation ("DEC") regulations for waste disposal. It will not involve the injection of waste materials or any harmful toxic substances into groundwater or wells. Stamatov pf. at 12; *see also* findings 336 through 338, below.

336. To minimize the possibility of a mineral oil release from power transformers to the underlying soil and groundwater, each new substation transformer will be mounted on a concrete foundation with an integral oil-retention system. The oil-retention systems will be designed in accordance with American National Standards Institute/Institute of Electrical and Electronic Engineers ("ANSI/IEEE") Standard 980, IEEE Guide for Containment and Control of Oil Spills in Substations. Stamatov pf. at 12.

337. The generation of construction debris will be minimal. All construction debris will be disposed of at an approved construction and demolition debris landfill. Stamatov pf. at 12.

338. At the Vernon Substation, a septic tank and leach field system will be constructed to handle sanitary wastewater from the toilet and sink to be located within the control building. The substation toilet facilities are used infrequently, primarily by maintenance personnel, as the substations are not manned. The toilet facility will be constructed in accordance with the applicable Department of Environmental Conservation regulations, and VELCO will obtain a water supply and wastewater disposal permit from DEC prior to construction of the toilet facility. Stamatov pf. at 13.

(7) Water Conservation [10 V.S.A. § 6086(a)(1)(c)]

339. The Project has considered water conservation, incorporates multiple use of recycling where technically and economically practical, utilizes the best available technology for such

applications, and provides for continued efficient operation of these systems. This finding is supported by findings 340 and 341, below.

340. Presently, water consumption at the Coolidge Substation is insignificant, as the only water-consuming fixtures include a toilet, sink, and an emergency eye wash/shower device. No changes with respect to these fixtures are planned at this facility. Stamatov pf. at 13.

341. A water supply well is planned for the Vernon Substation for a toilet, sink and eye-wash station. Since the substation is not manned, the water use anticipated for this facility will be infrequent and minimal. No water-consuming fixtures are planned for the Newfane Substation. Stamatov pf. at 13.

(8) Floodways [10 V.S.A. § 6086(a)(1)(D)]

342. The Project will not restrict or divert the flow of floodwaters or increase the peak discharge of the streams and endanger the health, safety, and welfare of the public or of riparian owners during flooding. This finding is supported by findings 343 through 345, below.

343. The Project right-of-way crosses seven Federal Emergency Management Agency ("FEMA") Flood Insurance Rate Map 100-year floodways and floodway fringes, collectively referred to as special flood hazard areas. These are located at the Broad Brook in Guilford, the West River in Dummerston, Saxtons River in Windham, South Branch in Windham, Middle Branch/Williams River in Andover, Williams River in Chester, and the Black River in Cavendish. Exh. Petitioners SD-2 at 9, 10, and Figure 2.

344. None of the Project substations are located within a special flood hazard area, and none of the proposed structures for the Vernon-to-Cavendish 345 kV line or the Newfane Loop are located within a special flood hazard area. Exh. Petitioners SD-2 at 10.

345. In an event that a structure is located in a floodway or floodway fringe, each utility wood pole structure would represent less than 2-3 cubic yards of fill. These poles would not have a measurable impact on flood flow obstruction or flood storage capacity since utility poles have a small footprint or fill volume. Exh. Petitioners SD-2 at 10.

(9) Streams [10 V.S.A. § 6068(a)(1)(E)]

346. The Project will maintain the natural condition of involved streams and will not endanger the health, safety, or welfare of the public or adjoining landowners. This finding is supported by findings 347 through 355, below.

347. There are a total of 143 streams identified within the Project rights-of-way, including several tributaries to the Connecticut, West, Saxton, Middle Branch, and Black Rivers. There are 19 named second- and third-order streams and brooks identified within the Project rights-of-way, and VELCO has identified 124 small, mostly first-order unnamed tributaries with defined flow (seasonal and perennial), many of which border wetlands that are at the top of the drainage of these tributaries along the Vernon-to-Cavendish 345 kV right-of-way. Exh. Petitioners SD-2 at 12, Table 7-1, and Figures 1 and 2.

348. The Newfane Loop right-of-way crosses the West River and two small first-order tributary streams. Exh. Petitioners SD-2 at 12.

349. There are no streams located at the Project Substations. Exh. Petitioners SD-2 at 12.

350. Construction activity that could affect stream resources includes tree clearing and the ground disturbance associated with the construction of transmission pole structures, access roads and the installation of conductors. Exh. Petitioners SD-2 at 12.

351. VELCO has designed the project to locate new pole structures as far from stream banks as feasible to maintain appropriate stream riparian buffers, and particularly for those associated with Class Two wetlands. Exh. Petitioners SD-2 at 12.

352. Where new pole structures are to be located within a stream buffer, construction impacts will be temporary and mitigated with appropriate erosion control and site-restoration practices. Exh. Petitioners SD-2 at 13.

353. With respect to construction access, to the extent feasible, existing access roads and culvert stream crossings will be utilized for the construction of transmission line components of the Project. Where stream-crossing avoidance is not feasible, temporary bridges or construction mats may be used. VELCO will utilize stream-crossing methodologies and best management practices outlined in the Stream Crossing Plan. Exh. Petitioners SD-2 at 13.

354. Additionally, several permanent culverts will be installed to facilitate construction as well as future maintenance activities and emergency repairs. All work will be performed in compliance with applicable ANR and U.S. Army Corps of Engineers permits. Exh. Petitioners SD-2 at 13-14.

355. With regard to tree removal at or near stream crossings, VELCO's Transmission Vegetation Management Plan incorporates vegetation-management practices designed to protect streams, stream buffers and shoreline resources. The objective of the stream-crossing management is to favor vegetation that will shade the stream, control erosion, and promote bank stability. Exh. Petitioners JD-2 at 7; exh. Petitioners SD-2 at 14.

(10) Shorelines [10 V.S.A. § 6086(a)(1)(F)]

356. The Project will, insofar as possible, retain all shorelines and waters in their natural condition, allow continued access to the waters and the recreational opportunities provided by the waters, retain or provide vegetation which will screen the Project from the waters, and stabilize the bank from erosion, as necessary, with vegetation cover. This finding is supported by findings 357 through 362, below.

357. The Vernon-to-Cavendish 345 kV right-of-way does not cross any lakes, and crosses only one pond. This pond is an unnamed pond/wetland complex on a first-order tributary to Mill Brook, and is impounded by a beaver dam. Exh. Petitioners SD-2 at 16 and Figure 2, sheet 6.

358. The Vernon-to-Cavendish 345 kV right-of-way crosses three applicable rivers with shoreline resources: the West River, Saxton River and Black River. The Newfane Loop right-of-way also crosses the West River east of the substation. Exh. Petitioners SD-2 at 16 and Figure 2, sheet 4, 7, and 10.

359. While the Vernon to Cavendish 345 kV right-of-way parallels the Connecticut River shoreline for approximately one mile, there will not be clearing or construction within 100 feet of the river shoreline. Exh. Petitioners SD-2 at 16 and Figure 1, sheet 1.

360. The Vernon substation is proposed to be located on a natural plateau approximately 35 feet above the mapped 100-year floodplain of the Connecticut River on a high bluff. There is no access to the river from the bluff area and the horizontal distance from the shoreline boundary

to the proposed substation is over 200 feet. The river bluff is characterized by an existing vegetated buffer and steep vegetated stable bank. The location and construction of the proposed substation will not disturb any vegetation in the forested buffer it will not change any drainage patterns nor will it disturb soil that would result in bank erosion in the adjacent shoreline area. Exh. Petitioners SD-2 at 16 and Figure 1, sheet 1.

361. Proposed pole structures and access will be located at least 100 feet from shoreline boundaries of the four shoreline resource areas on the Vernon-to-Cavendish 345 kV right-of-way and Newfane Loop right-of-way. Project activity areas adjacent to shoreline resources will be limited to the additional 100 feet of tree clearing necessary to accommodate the new transmission lines at the West River and Black River right-of-way crossings. Exh. Petitioners SD-2 at 17 and Figure 1.

362. Vegetation management practices and site-specific Erosion Prevention and Sediment Control plans will retain the natural conditions of the river shorelines, will not affect access to any river for recreational purposes, will maintain a shoreline vegetation screen between the right-of-way and the river, and will not affect the stabilization of the river bank from erosion. Exh. Petitioners SD-2 at 17.

Discussion

Subsection 6086(a)(1)(F) provides:

A permit will be granted whenever it is demonstrated by the applicant that, in addition to all other criteria, the development or subdivision of shorelines must of necessity be located on a shoreline in order to fulfill the purpose of the development or subdivision, and the development or subdivision will, insofar as possible and reasonable in light of its purpose:

- (i) retain the shoreline and the waters in their natural condition,
- (ii) allow continued access to the waters and the recreational opportunities provided by the waters,
- (iii) retain or provide vegetation which will screen the development or subdivision from the waters, and
- (iv) stabilize the bank from erosion, as necessary, with vegetation cover.

This subsection makes clear that the intent of the Vermont General Assembly in passing this statute was to provide substantial protection for the environmental, scenic, and recreational characteristics of the State's shorelines.

No party has raised the issue of whether the proposed Project "must of necessity be located on a shoreline in order to fulfill the purpose" of the project. However, we determine that this standard has been met in this case. The transmission lines will follow an existing transmission corridor for the majority of its length. This route is therefore the most economic and environmentally feasible route. In addition, it would be impossible to construct a transmission system without crossing shoreline of any rivers in Vermont. We therefore conclude that the proposed Project meets the necessity portion of this subsection.

The evidence indicates that the proposed Project can be constructed to ensure that it will not have an adverse environmental impact on shorelines. As specified in Finding 362, VELCO will develop site-specific erosion control plans for the proposed Project, for approval by ANR.

Another component of this subsection is the requirement that a project not unreasonably interfere with access to the recreational opportunities on the shorelines. There is no indication that access to any waters will be impaired by the proposed Project.

Subsection 6086(a)(1)(f) also requires that the project retain or provide vegetation which will screen the development or subdivision from the waters. The proposed Project crosses several water bodies. These crossings are within an existing transmission corridor, but the right-of-way for all of the crossings must be expanded to accommodate the larger lines. VELCO has indicated that it will minimize clearing in these areas and attempt to retain as much existing vegetation along the shoreline as possible. However, the proposed Project will still result in decreased vegetation along the shorelines. The statute does not prohibit such clearing, but requires the developer to, "insofar as possible and reasonable in light of its purpose . . . retain or provide vegetation which will screen the development or subdivision from the waters." The water bodies crossed by the proposed Project will be impacted by the presence of lines spanning the water, and it is not possible to screen this impact. VELCO has committed to placing transmission structures as far from the shoreline as possible at these crossings, and retain as much existing vegetation as possible. Based upon these factors, we conclude that the vegetative

component of this subsection is satisfied for those areas where the proposed Project crosses water bodies.

(11) Wetlands 10 V.S.A. § 6086(a)(1)(G)

363. The Project will not create an undue, adverse impact upon significant wetlands. This finding is supported by findings 364 through 378, below.

364. The Vermont Wetland Rules protect "Class One" and "Class Two" wetlands as "significant" wetlands. There are no Class One wetlands impacted by the Project. Exh. Petitioners SD-2 at 17; Damiano/Connaughton/Stamatov reb. pf. at 3.

365. VELCO filed a Project Conditional Use Determination ("CUD") application with the ANR on May 13, 2008, and the application identified 24 Class Two wetlands within the Project area. As part of the CUD application review process, VELCO and ANR personnel conducted field inspections of the wetlands delineated on the Project Plans, and based on this collaborative field verification, ANR subsequently determined that 11 wetlands previously identified by VELCO as Class Two are in fact Class Three wetlands. Damiano/Connaughton/Stamatov reb. pf. at 4.

366. Therefore, there are a total of 13 jurisdictional Class Two wetlands located within the entire 51-mile Southern Loop Project corridor subject to regulation under the Vermont Wetland Rules. Damiano/Connaughton/Stamatov reb. pf. at 4; exh. Stipulation 1 at 1.

367. There are 159 Class Three wetlands identified in the Vernon to Cavendish right-of-way. The proposed design for the right-of-way indicates that 17 structures will be located in Class Three wetland resources. Exh. Petitioners SD-2 at 20, 24, and Table 9-1.

368. No wetlands were identified at the Vernon or Coolidge Substations, and two small Class Three wetlands were identified at the Newfane Substation. Three small Class Three wetlands were identified along the Newfane Loop right-of-way. Exh. Petitioners SD-2 at 20 and Table 9-1.

369. VELCO will seek authorization for temporary and permanent alterations of wetlands under a CUD permit with ANR for activities in the Class Two wetlands and associated buffer zones, and a Clean Water Act, Section 404 permit from the U.S. Army Corp of Engineers for

temporary or permanent Class Two and Three wetland impacts associated with the Project. Exh. Petitioners SD-2 at 24-25.

370. Petitioners have agreed to undertake certain mitigation and avoidance measures such that the Project will not create an undue adverse impact upon the functions and values of Class Two wetlands. Exh. Stipulation 1 at 1.

371. The Project as proposed will avoid or minimize impacts to Class Two wetlands by (1) avoiding pole placement in wetlands to the extent practicable, (2) use and restoration of existing access routes where practicable, and (3) implementation of best management practices ("BMPs") consistent with VELCO's Environmental Guidance Manual. The BMPs included in VELCO's Environmental Guidance Manual are well designed to avoid and minimize impacts to the functions and values of significant wetlands. Metz pf. at 6-7; Damiano/Connaughton/Stamatov reb. pf. at 5; exh. Stipulation 1 at 1-2.

372. VELCO's BMPs for conducting construction work in wetlands include: (1) if feasible, use of existing access routes; (2) if feasible, conduct work under winter or dry conditions; (3) when winter or dry conditions are not present or do not persist for a sufficient work period, conduct work using construction mats or other authorized temporary fills; and (4) access with the use of permanent fills in accordance with permit authorizations. Metz pf. at 7; Damiano/Connaughton/Stamatov reb. pf. at 6; exh. Stipulation 1 at 2.

373. Construction activities need not be restricted to the winter months only. Exh. Stipulation 1 at 2.

374. Construction matting will be performed in accordance with Army Corps of Engineers ("ACOE") regulations and associated CUD permit activities to remove temporary fills started within two weeks of work completion. *Id.*

375. VELCO revised the proposed location for pole structure 115 by 80 feet to the north to avoid impacts to wetlands. Metz pf. at 7; McNamara/Buscher/Jones/Kirby reb. pf. at 18; exh. Petitioners Supplemental RR-1 at 2.

376. VELCO also revised proposed locations for pole structures 35, 150 and 389 to minimize wetland impacts. Exh. Petitioners Supp. RR-1 at 2.

377. To address third-party all-terrain vehicle use in the corridor that may impact wetlands, Petitioners agree to send letters to relevant landowners, and engage in general training and presentations to local ATV groups. Exh. Stipulation 1 at 2.

378. The Petitioners and ANR agree that there should be no restriction with respect to clearing that would violate or otherwise be inconsistent with NERC reliability standards for vegetation management. *Id.*

(12) Sufficiency of Water and Burden on Existing Water Supply [10 V.S.A. § 6086(a)(2) and (a)(3)]

379. The Project will not burden existing water supplies. This finding is supported by findings 340 and 341, above.

(13) Soil Erosion [10 V.S.A. § 6086(a)(4)]

380. The Project will not cause unreasonable soil erosion or reduction of the land to hold water so that a dangerous or unhealthy condition may result. This finding is supported by findings 381 through 390, below.

381. The Project rights-of-way traverse numerous soil types. These soil types differ in slope, texture, stoniness, wetness, and degree of potential erosion. Most of the soils are not suitable for crop farming. Exh. Petitioners SD-2 at 26.

382. Several soil series within the Project rights-of-way are classified as highly erodible and require special attention and management during construction. These soils are generally located in areas of steep slopes, 15 to 60 percent. These areas will be addressed in the project-specific Erosion Prevention and Sediment Control ("EPSC") Plan. *Id.*

383. Reduction of permeable soils from new structure installations will not result in an unreasonable risk of creating large disturbance areas, interruptions in drainage, or significant runoff problems that would affect the water quality of streams or wetlands. Individual pole structure work sites are typically less than 5,000 square feet and manageable with appropriate erosion control practices. *Id.*

384. The proposed substations are located on level ground and pose a low risk of erosion. As a preventive practice, the substation site perimeters will be lined with embedded silt fence and staked hay bales to ensure that no soil is transported from work areas during rainfall periods. *Id.*

385. For tree clearing, VELCO employs the practices discussed in its Transmission Vegetation Management Plan, which utilizes as a guide, ANR's Acceptable Management Practices for Maintaining Water Quality on Logging Jobs. These measures will adequately protect against unreasonable soil erosion and are consistent with the site-specific erosion prevention and sediment control practices that are typically incorporated into VELCO's EPSC plans for its transmission projects, and similar measures are incorporated into EPSC plans for the Project. *Id.*

386. Applicable site-specific plans and restoration procedures will be developed for access roads, work sites around pole structures, stream and wetland crossings, and steep slope areas greater than 15 percent, to minimize the risk of soil erosion and sediment runoff from Project access roads and work sites. Applicable erosion controls and restoration will be outlined in VELCO's EPSC plan as required for its construction permit. *Id.*

387. The Petitioners have submitted to ANR a site-specific EPSC Plan and associated construction permit applications for the transmission lines, Coolidge Substation and Newfane Substation. The construction permit application associated with the Vernon Substation is currently under development. Exh. Stipulation 1 at 5.

388. Tree clearing is typically performed by VELCO-approved vegetation management contractors using chainsaws. On large tracts such as the Southern Loop Project, trees are cleared with mechanical, specialized tree-clearing equipment. Trees are cut as close as possible to grade (e.g., typically six inches or less), and the stumps are left intact, as this minimizes ground/soil disturbance and promotes soil stability. In some cases, VELCO will remove stumps that are located within access roads, in the immediate vicinity of structure locations, within proposed excavation areas, or based upon other construction-specific needs. Disorda pf. at 16.

389. Promoting stable plant communities on the right-of-way allows strong, healthy root-mat conditions that are effective in stabilizing soil and controlling erosion. VELCO's Transmission Vegetation Management Plan addresses erosion control by encouraging compatible plants such

as ferns and grasses, sweet-fern, blueberries, blackberries, raspberries, dogwood and other low-growing shrubs as well as a variety of wild flowers. *Id.*

390. In areas where incompatible species dominate the right of way, erosion controls may be more of a concern. However, in these areas the strong root-mat conditions of the incompatible species are typically effective in controlling erosion until either compatible species begin to grow in or incompatible species re-sprout. *Id.*

(14) Transportation Systems [10 V.S.A. § 6086(a)(5)]

391. The Project will not cause unreasonable congestion or unsafe conditions with respect to the use of the highways, waterways, railways, airports and airways, and other means of transportation existing or proposed. This finding is supported by findings 392 and 393, below.

392. During delivery of large Project equipment on roadways and during construction of the Project transmission lines at highway and road crossings, Petitioners will employ the services of traffic-control personnel to manage traffic flow. Petitioners will obtain all required highway-crossing permits. No public roads will need to be excavated in order to complete this Project. Stamatov pf. at 14.

393. The new 345 kV Vernon-to-Coolidge transmission line will span railroad crossings in two locations: one in Vernon just north of the Vermont Yankee Nuclear Power Station, and a second in Ludlow, on the south side of Route 103. The line has been designed to meet applicable clearances at these crossings, and will not have any adverse effect on railway transportation systems or railway operations. *Id.*

(15) Educational Services [10 V.S.A. § 6086(a)(6)]

394. The Project will have no impact upon educational services provided by local school systems, other than to enhance the reliability of the electrical service currently provided. As such, there will be no adverse impact upon educational services. *Id.*

(16) Municipal Services [10 V.S.A. § 6086(a)(7)]

395. The Project will not place an unreasonable burden on the ability of the affected local governments to provide municipal or governmental services. The Project will require some coordination with local law and traffic enforcement services to coordinate the safe delivery of large equipment or oversized loads to substations, staging areas and the corridor. This coordination is minor in nature and occurs typically just in advance of equipment/material deliveries. *Id.*

(17) Aesthetics [10 V.S.A. § 6086(a)(8)]

396. The Project will not have an undue adverse effect on aesthetics or on the scenic or natural beauty of the area, subject to, and upon compliance with, the conditions set forth in the Order below. This finding is supported by findings 397 through 483, below.

397. The Memorandum of Understanding, dated October 13, 2008, among VELCO, CVPS and the Department, among other things, addressed outstanding concerns of the Department about the Project's potential effects on aesthetics under 30 V.S.A. § 248(b)(5). In addition to this Memorandum of Understanding, aesthetics consultants to the Petitioners and the Department reached additional understandings regarding landscape mitigation plans, which were detailed in a memorandum dated October 23, 2008. Exhs. Stipulation 5, 5A; exh. Petitioners MJB-4 REVISED.

(a) General Findings Regarding Aesthetics

398. The width of the right-of-way obtained for the 340 Line in the late 1960's anticipated the eventual construction of a second transmission line. The 360 Line will be situated in this right-of-way. Exh. Petitioners MJB-2 at 6; McNamara pf. at 4-5.

399. Although the use of the existing right-of-way for the 360 Line significantly mitigates its visual impact, the Project, as a whole, will have an adverse impact on the aesthetics and scenic beauty of the area. As a result of the Project, the number of transmission structures in the right-of-way will double, and further clearing of woodlands will be required to accommodate the 360 Line (which will involve the loss of screening, auditory and climatic buffers). Additionally,

the Newfane Loop, the Vernon Substation and the expansion of the Coolidge Substation will have notable aesthetic impacts. Exh. DPS-DR-11-12.

400. The transmission corridor is, for most part, located within sparsely populated areas and through areas that are heavily forested, such that the visibility of the Project will generally be limited. The principal areas from which views of the 360 Line are likely consist largely of roads and surrounding private property situated within rural settings. Exh. Petitioners MJB-2 at 11; Buscher pf. at 3-4.

401. The Petitioners' aesthetic consultant identified adverse impacts at the following 11 locations: Vernon Substation; Fort Bridgman Road (Vernon); Guilford Center Road (Guilford); Route 30 and the West River area (Dummerston); Taft Road (Townshend); Deer Valley Road (Townsend); Simpson Brook Road (Townshend); Simonsville Road, Vermont Route 11 (Andover); River Road (Newfane Loop); Vermont Route 103 (Cavendish); Coolidge Substation (Cavendish/Ludlow). Exh. Petitioners MJB-2 at 11.

402. These were generally the same locations identified by the aesthetics consultant for the Department as areas of concern or areas of high sensitivity with the potential for undue, adverse impacts in the absence of reasonable mitigation measures. Exh. DPS-DR-1 at 11-30; exh. Stipulation 5; exh. Stipulation 5A.

403. The applicants have taken reasonably available mitigation measures to ameliorate the visual impact of the Project. Mitigation measures include proposed structure location, structure design and the use of landscape planting and have been influenced by consultations with the Department, the affected communities and affected landowners. Exh. Petitioners MJB-2 at 11; exh. Petitioners MB-4 Revised; tr. 11/6/08 at 158-159 (Raphael).

404. The configuration of the 360 Line will match the existing line to the extent possible in an effort to create uniformity between the existing and proposed lines and reduce the impact of the 360 Line on the visual landscape. Wooden H-frame structures similar to the existing 340 Line will be used. New structure locations (which will usually parallel the existing structures) and structure heights have been assessed relative to the existing structures and the topography to minimize the visual impact to the extent feasible. VELCO intends to use a non-specular material for the new conductors, which should also reduce the visual impact of the

360 Line. Exh. Petitioners MJB-2 at 6; McNamara pf. at 5; exh. Petitioners SD-2; exh. Petitioners Supp. RR-4.

405. VELCO will conduct pre-construction field visits to review mitigation plans with landowners and the other parties, as appropriate, to field validate the effectiveness of the proposed mitigation plans and to gain consensus regarding execution of any such plan. VELCO will share these mitigation plans with the Department, which will review and comment on the plans within 45 days. The Department reserves the right to review the aesthetic impact after the Project is constructed. In the event that following construction, field inspections reveal that the actual post-construction conditions at certain sites are substantively different from those anticipated when the mitigation plans were created, the Department may request additional plantings to ensure effective mitigation. The Petitioners and the Department will work in good faith to reach agreement on the appropriate mitigation measures. Exh. Stipulation 5 at 6.

406. In numbered paragraph 10 of its Memorandum of Understanding with the Petitioners, the Department indicated support for VELCO's mitigation plans for the Project in all but the following seven locations: Fort Bridgman Road; Franklin Road/Skyline Drive; Guilford Center Road Crossing; Brookline-Hill Road; Deer Valley Road; Taft Road; and, Route 103. The Department also reserved the right to a post-construction review of the mitigation measures near the Vernon Substation. After the Project is constructed, VELCO and the Department will review mitigation plans in the field at these eight locations and make modifications as appropriate. Exh. Stipulation 5; exh. Stipulation 5A.

407. The Department's consultant on aesthetics contemplates a review of the effectiveness of these mitigation plans both before and after any mitigation plantings are made. Tr. 11/6/08 at 154 (Raphael).

408. Most of the town plans for the communities directly affected by the Project recognize the importance of the visual landscape and reflect a broad desire to protect the aesthetic quality of the landscape. The utilization of existing transmission corridors is encouraged in many of these town plans. None of the town plans include aesthetic standards of sufficient specificity to conclude that the Project will violate a clear, written community standard intended to preserve

the aesthetics, or scenic beauty, of the area through which the Project is located. Exh. Petitioners MJB-2 at 12; exh. DPS-DR-1 at 74.

(b) Fort Bridgman Road/Vernon Substation

409. The new Vernon Substation will be constructed within the fence line of Entergy's existing Vermont Yankee plant and facilities in a vacant field just north of the existing plant and substation yard. Exh. MJB-2 at 6-7.

410. The Vernon Substation site will be approximately 9 acres, and will include a new 345 kV substation, two 345/115 kV power transformers, and a new 115 kV substation. Exh. Petitioners Supp. RR-7 at 1; exh. Petitioners MJB-2 at 7.

411. On October 3, 2008, the Petitioners submitted a revised design for the Vernon Substation, which reflected a 100-foot westward shift in the substation footprint based on more detailed data obtained through additional access to the Entergy property. The shift in location of the substation resulted in removal of additional vegetation along the northern fence of the substation and minor removal of vegetation to the southwest of the substation. As part of the shift in the substation, there is also a need to relocate a parking area used by Entergy to a location outside of the western hedgerow. The shift in the substation will result in additional visibility of the substation and of transmission infrastructure compared to the original conceptual landscape mitigation plans. Exh. Petitioners Supp. RR-25 at 3-4; exh. Petitioners Supp. RR-7 at 1.

412. In response to the increase in visibility, VELCO's aesthetics consultant prepared alternative mitigation plans which included three berms constructed from excess material from the substation excavation and a mix of evergreen and deciduous plantings on each berm. As proposed, the northern-most berm would be located north of the substation property on the adjoining property owner's land, within an agricultural field currently in use. The two berms along the western edge will also effectively screen the relocated parking area. Exh. Petitioners Supp. RR-25 at 4.

413. The Town of Vernon Selectboard is opposed to mitigation plantings or berming that would impact areas in current agricultural use. In response to a review of the plans with the Millers, an adjacent property owner, and the concerns of the Vernon Selectboard about the

impairment of the limited amount of open agricultural land, VELCO's aesthetics consultant prepared an alternate plan that incorporates a north berm within the fence of Vermont Yankee and eliminates impacts within the agricultural fields. Exh. Stipulation 5A at 2; exh. Petitioners MJB-4 REV, Sheet L1.2; exh. Petitioners Supp. RR-25 at 4; exh. Stipulation 5A at 2.

414. The shift in the substation footprint and the reduction in proposed mitigation measures in response to local concerns will result in an increase in the visual impact of the Vernon Substation and the transmission infrastructure, albeit in an area that already has a significant visual presence of electrical transmission and generation infrastructure. Exh. Petitioners Supp. RR-25 at 4; tr. 11/6/08 at 154 (Raphael).

415. As part of the Project, six large existing 345 kV steel-lattice towers will be removed near the substation site. A series of new poles will connect the existing lines into the new substation and provide connections between the new substation and the existing substation. The 360 Line will also introduce new structures into this area. Exh. Petitioners MJB-2 at 105, 107; exh. Petitioners Supp. RR-6.

416. Views of the substation site and lines exiting the substation are most readily available from Fort Bridgman Road and Governor Hunt Road. The Vernon town offices, library, and elementary school are located along Governor Hunt Road. Most visible will be the 80-foot tall steel A-frame structures and the 80-foot tall static masts for lightning protection. Exh. Petitioners MJB-2 at 105.

417. The 345 kV transmission line corridor first parallels Fort Bridgman Road to the east after leaving the Vernon Substation. It then angles and crosses Fort Bridgman Road perpendicular in an east-west direction between structures 8S and 9S and continues to the west. Exh. Petitioners MJB-2 at 17.

418. There will be a noticeable increase in transmission infrastructure in views from the Fort Bridgman Road area. Views when traveling south towards structure 8-S and 8-SW will be unobstructed and views traveling north will be increased with the removal of part of the hedgerow that currently provides screening. Further south on Fort Bridgman Road, views of several structures leaving the Vernon Substation will be visible. Within the slightly larger context of the area, there are several large industrial and commercial businesses that operate

along Fort Bridgman Road (which is designated as a National Scenic Byway), including lumber mills, a concrete plant, and others. Exh. Petitioners MJB-2 at 17-19.

419. Reasonably available mitigation efforts that are proposed by Petitioners include the use of self-weathering steel structures, painting the existing structures a similar color, and the introduction of mitigation planting to help soften views. Exh. MJB-2 at 19.

420. Plantings will include evergreens to supplement the existing hedgerow south of the corridor near structure 8-S. This will help provide screening during leaf-off conditions. A mix of deciduous and evergreen plantings are also proposed for the area that will be cleared for the new line. Exh. Petitioners MJB-2 at 19; exh. Petitioners MJB-4 REV, Sheet L1.3.

421. The adequacy of landscape mitigation plans in the Fort Bridgman Road area and for the Vernon Substation will be reviewed by the Petitioners and the Department following construction, and field modifications to these plans will be made as appropriate. Exh. Stipulation 5 at 6; exh. Stipulation 5A at 1.

(c) Franklin Road/Skyline Drive

422. The Memorandum of Understanding among the Petitioners and the Department recognizes that the Department has some concerns with respect to aesthetic impacts at this location. Exh. Stipulation 5 at 5.

423. However, the impacts do not affect public views. VELCO has agreed to work with the two affected landowners, and the Department has not suggested any additional mitigation in this area. Exh. Stipulation 5A at 2.

(d) Guilford Center Road

424. There is a combination of views of the existing corridor from Guilford Center Road including distant views and close-up views. The most prevailing of these views is when approaching the corridor from the southwest, from which views to existing structure 26, less than 100 feet off the road, are readily available. Other views include more distant views of the corridor entering Weatherhead Hollow from either ridge and of the crossing itself. Views of Project upgrades will be possible from several vantage points along Guilford Center Road,

primarily from the same view locations that the existing line can be seen from. Exh. Petitioners MJB-2 at 31.

425. Views of the upgrades from the northeast begin as the road descends a small hill past an old farmstead approximately 800 feet from the corridor. These views will consist of additional structures and cleared right-of-way on hillsides to both sides of the road. Views of the clearing and structures on East Mountain will be over 2,400 feet from the closest view point. Views to East Mountain are also limited to a short duration, a few hundred feet, before they are blocked by the mature stand of evergreens. Exh. Petitioners MJB-2 at 31- 32.

426. To the northwest, Structure 27 is set back over 800 feet from the road, which helps to lessen visual impacts from the new structures. Structure 28 and 29 are even further back in the views to the northwest of Guilford Center Road. Views to the northwest are not continuous. Intermittent vegetation along the side of the road provides various degrees of screening of views as the lines ascend the northern slopes of the valley. Views from the Southwest of proposed structure 26 (which will be 50-60 feet from the road) will be obvious. Project upgrades will be visible from the Weatherhead Hollow Road area. However, views are broken by irregular clumps of roadside vegetation, and other small stands of trees within the fields when proceeding along Guilford Center Road. Exh. Petitioners MJB-2 at 32.

427. Mitigation plantings are proposed west of the corridor, along the southern edge of the road to provide additional screening when approaching the corridor from the southwest, with infill of roadside vegetation north of the road and east of where the corridor crosses the road. Plantings are also proposed along the southern edge of the roadway and west of the corridor crossing. Exh. Petitioners MJB-2 at 32; exh. Petitioners MJB-4 REV, Sheet L2.1.

428. After the Project is constructed and before any plantings are placed in the ground, the Petitioners and the Department will review the mitigation plans in the field and conduct field modifications as appropriate. Exh. Stipulation 5 at 6.

(e) West River Road (Vermont Route 30) and the West River, Dummerston

429. Project upgrades will result in increased visibility of transmission infrastructure from several locations at the Route 30 and West River area. Increased views will be possible from

along Route 30 west of the corridor, from the parking area southwest of the crossing, and from the swimming area and banks of the West River. Exh. Petitioners MJB-2 at 53-55.

430. When approached from the west, additional clearing within the right-of-way and the inclusion of a second 345 kV line will increase views of transmission lines. The vegetation that remains along the west side of the corridor will help to screen the new line. The increase in visibility will be much less noticeable during leaf-on conditions. As travelers continue closer, approximately 800 feet west of the corridor, views of existing structure 114 will increase due to clearing for the additional line. Similar views from the parking area will have increased visibility of existing structure 114. Exh. Petitioners MJB-2 at 55.

431. VELCO has mitigated impacts associated with this structure by revising its design plans to set the proposed new structure 114 sixty feet farther back from the road than originally planned, which will allow the structure much better screening from adjacent vegetation to the west. Exh. Petitioners MJB-2 at 55.

432. Views from the banks of and from the West River will also be altered. Clearing for the new line, north of the river, will open views towards the existing structure 115 where views were not previously available, as well as to the new structure 115. Exh. Petitioners MJB-2 at 55.

433. VELCO has mitigated impacts associated with this structure by revising its design plans to shift new structure 115 eighty feet north, which has the potential to move the structure further out of view, resulting in an aesthetic improvement. Mitigation plantings are proposed south of Route 30 to help soften views to structure 114. Exh. Petitioners Supp. RR-25 at 2; exh. Petitioners MJB-2 at 55-56; exh. Petitioners MJB-2 REV, Sheet L4.1.

434. The increase in visibility due to Project upgrades and additional transmission infrastructure will create noticeable changes to the visual character of the area. With the proposed mitigation measures to relocate the new structures further away from the roadway and the proposed plantings, the adverse impact to this area will not be undue. Exh. Petitioners MJB-2 at 54-56; exh. Petitioners MJB-2 REV, Sheet L4.1; tr. 11/6/08 at 158-159 (Raphael).

(f) Hill Road, Brookline

435. The existing utility corridor crosses Hill Road in the Town of Brookline. The addition of the 360 Line generally will create increases in visibility but will not significantly change the visual character of the area. Exh. Petitioners MJB-2 at 67; exh. Petitioners Supp. RR-25 at 2.

436. The Department has concerns about aesthetic impacts along Hill Road, not at the point where the 360 Line will cross Hill Road, but from a location further south looking at the corridor on Putney Mountain. These views are approximately 1½ to 2 miles from the parts of the existing line that are visible. Exh. Stipulation 5A at 3.

437. The Town of Brookline has expressed similar concerns, but does not wish to install landscaping that would screen views of the mountain. There is little ability to screen views of the lines while preserving views of the mountain. Exh. Stipulation 5A at 3.

438. The Department reserves the opportunity to review post-construction conditions with the Petitioners to ascertain whether there are any options for mitigation, if so desired. Exh. Stipulation 5A at 3.

(g) Taft Road (Crane Mountain), Townshend

439. At Taft Road, the corridor crosses the road at an angle: views south along the corridor are accentuated when traveling west, as are views north when traveling east, due to the angle of the crossing. On the far west side of the corridor, the roadway curves slightly and runs parallel within the corridor for about 200 feet. Taft Road stays within the corridor for 700 to 800 feet. Exh. Petitioners MJB-2 at 69.

440. This section of road is currently buffered to the existing line by a narrow but mature hedgerow. The existing buffer will need to be removed for the new line. This will result in increased visibility of the transmission lines when crossing the corridor, as views will naturally be directed down the corridor. Exh. Petitioners MJB-2 at 69.

441. Views will be at close range as vehicles will pass only feet from the proposed structure 164 and views to the south will continue a single span to angle structure 163 where the line shifts more directly south and out of sight. Views to the north will continue several spans into the

distance. It is also likely that the clearing will create some degree of increased visibility for travelers when approaching the corridor from the west. Exh. Petitioners MJB-2 at 69.

442. The increase in views from clearing for the new line at Taft Road will create a noticeable change to the visual character of the area. Exh. Petitioners MJB-2 at 69.

443. The Petitioners have proposed reasonable mitigation to replicate roadside vegetation that is compatible within the transmission right-of-way and that will help screen and soften views of the existing and new lines. Exh. Petitioners MJB-2 at 74-76; exh. Petitioners MJB-4 REV, Sheet L7.1.

444. Planting locations proposed to mitigate aesthetic impacts in this area are preliminary and will need to be field located after completion of construction. In addition, some existing vegetation may be able to be retained. Exh. Stipulation 5 at 5; exh. Stipulation 5A at 3.

445. The Petitioners and the Department will review the mitigation plans in the field and conduct field modifications after the Project is completed but before any plantings are placed in the ground. Exh. Stipulation 5 at 6.

(h) Deer Valley Road (southern crossing), Townshend

446. Deer Valley Road crosses the corridor in an east-west direction, at approximately a 45-degree angle, directly adjacent to a sizable wetland. Views of the corridor are currently well screened until travelers are within the crossing. Exh. Petitioners MJB-2 at 74.

447. Project upgrades will increase views toward transmission infrastructure and will result in a change to the visual character of the area. Vegetation removed for the new line will open views when approaching the corridor from the west, and the placement of proposed structure 189 will also be in alignment with a straight section of road to the west. Vegetation removed will increase views towards the southeast along the corridor. The second line will be clearly visible extending to the distance in these views. Exh. Petitioners MJB-2 at 74-76.

448. The Petitioners investigated altering the design to move new structure 189 south of the road to avoid views focused on the structure when traveling from the west, but concluded this would create more visual impacts by detracting from views across the wetland. Exh. Petitioners MJB-2 at 74-76.

449. The Petitioners have proposed reasonable mitigation plantings within the corridor and mature trees that overhang the road will screen views of structure 189. Plantings along the roadside to the south will help screen extended views along the corridor. Exh. Petitioners MJB-2 at 74-76; exh. Petitioners MJB-4 REV, Sheet L7.3.

450. Petitioners and the Department will review the mitigation plans in the field following construction. Exh. Stipulation 5A at 3; exh. Stipulation 5 at 6.

(i) Simpson Brook Road/Acton Hill, Townshend

451. Simpson Brook Road and Acton Hill Road come to an intersection within the existing transmission right-of-way, and their alignment focuses views along the corridor. There is little existing vegetation within the corridor at the intersection of the roads. Exh. Petitioners MJB-2 at 84.

452. When approaching the crossing, views are well screened due to the dense vegetation and the slightly meandering alignment of both roads approaching the crossing. However, views from within the corridor are extended due to navigating the intersection and the orientation of the roads. Views are limited in either direction to a single span due to intervening topography. Exh. Petitioners MJB-2 at 84.

453. Clearing to accommodate the new line will remove an existing buffer between Simpson Brook Road and the corridor. Existing views will be extended when approaching the corridor from the west and will have a noticeable increase in the amount of transmission infrastructure. Views when navigating the intersection will allow focus on new structures both north and south of the intersection. Exh. Petitioners MJB-2 at 84.

454. Adverse impacts at this location will be offset by proposed mitigation plantings within the corridor that will soften and screen views in the area. As a result, the impacts will not be unduly adverse. Exh. Petitioners MJB-2 at 84; exh. Petitioners MJB-4 REV, Sheet L7.5; exh. Stipulation 5 at 5; tr. 11/6/08 at 156 (Raphael).

(j) Route 11/Simonsville Road, Andover

455. When approaching the corridor at this location, adjacent vegetation and buildings screen the majority of views. Views of existing structure 307 are possible when approaching from the east, for approximately 500 feet prior to the crossing, due to clearing for a residential property adjacent to the corridor. Views across a residential property when approaching the crossing from the west are also possible, but views of the corridor are currently screened with an existing hedgerow separating the residence and corridor. Visibility and the duration of views to the line will increase with the new 360 Line due to required clearing. The hedgerow that currently separates the residential property west of the crossing will need to be removed, creating increased views from the roadway. Exh. Petitioners MJB-2 at 91.

456. Mitigation plantings are proposed to help screen the increase in visibility. With the proposed mitigation plantings, there will be no undue adverse impacts resulting from Project upgrades. Exh. Petitioners MJB-2 at 91; exh. Petitioners MJB-4 REVISED, Sheet L10.1; exh. Stipulation 5A at 4; exh. Stipulation 5 at 5; tr. 11/6/08 at 156 (Raphael).

(k) Newfane Substation and Newfane Loop

457. In their initial design, the Petitioners planned to expand the existing CVPS 46 kV West Dummerston Substation (adding 345/115 kV/46 kV capacity and equipment) to supply the local 46 kV sub-transmission system via access to the 360 Line through a proposed Dummerston Loop. The West Dummerston Substation is located along Vermont Route 30 adjacent to the West River in the Town of Dummerston. If the substation was sited in Dummerston, the proposed loop would need to cross Camp Arden Road and the West River and would not be able to utilize an existing CVPS transmission corridor that currently contains a 46 kV line as originally conceptualized when beginning the Project. Exh. Petitioners MJB-2 at 7.

458. Following public comments and additional review, the Petitioners identified an alternate substation site at an abandoned gravel pit site located off of Route 30 in the Town of Newfane, Vermont. Exh. Petitioners MJB-2 at 7.

459. The proposed Newfane Substation will be located on a plot of land between Route 30 and River Road in the Town of Newfane. It will be located on the eastern side of the site,

recessed in the area previously excavated for gravel extraction. The site is separated from River Road by a large earthen berm created by the previous excavation on the site, but leaving a large strip of land adjacent to River Road undisturbed. This strip of land is largely vegetated with a mix of evergreen and deciduous vegetation with the exception of where the existing CVPS 46 kV corridor enters the site. As such, the Newfane Substation site is well screened and hidden from outside views by surrounding topography and existing vegetation. Exh. Petitioners MJB-2 at 110; exh. DPS-DR-1 at 24.

460. The Department's aesthetic consultant concluded that the proposed site of the Newfane Substation "is an excellent location for the new substation." Exh. DPS-DR-1 at 24.

461. Because of the screening, there will be minimal views of the proposed substation. There likely will be views of a new 345 kV structure that will bring lines to the substation from the Vernon-to-Cavendish 360 Line. Still, this structure will be located at the back side of the steep slope that is immediately adjacent to River Road, not within the general viewing area of vehicles traveling River Road. Exh. Petitioners MJB-2 at 110; exh. Petitioners Supp. RR-25 at 5.

462. The Newfane Loop will consist of an approximately one mile 345 kV loop from the 360 Line into and out of the proposed Newfane Substation. The two 345 kV lines constituting the Newfane Loop will not be located in the existing utility corridor for the 340 Line and the 360 Line. Instead, they will be sited alongside an existing CVPS 46 kV transmission line as it heads west from the 340 Line and 360 Line corridor towards the site of the proposed Newfane Substation. McNamara pf. at 11; exh. Petitioners Supp. RR-5.

463. The existing CVPS 46 kV transmission line is located in a 150-foot right-of-way in which 100 feet is currently cleared. The existing transmission poles are 48 feet in height. Exh. Petitioners MJB-2 at 117; exh. Petitioners Supp. RR-1 at 3; exh. DPS-DR-1 at 24.

464. A variety of alternative proposals were considered by the Petitioners in consultation with the Department for the structural design of the Newfane Loop and the existing 46 kV line with an objective of minimizing its aesthetic impact. The alternatives are detailed in Exhibit Stipulation 5 at 5. In the petition, the Petitioners' plans for the Newfane Loop contemplated a dual circuit on a single set of self-weathering steel poles with a structural height of 117 feet. The existing right-of-way for the 46 kV line would be widened by 80 feet to accommodate the steel pole structures

and the 345 kV lines (with 178 to 210 feet of clearing). Exh. Petitioners MJB-2 at 114-116; exh. DPS-DR-1 at 24; Raphael pf. reb. at 1.

465. The Petitioners and the Department agreed to a revised configuration for the Newfane Loop to reduce the heights of the structures required for the Newfane Loop so as to eliminate "sky lighting" of structures. Several simulations of different proposed configurations were created to help determine the preferred configuration. Exh. Petitioners Supp. RR-25 at 4 and Attachment 3 (Newfane Loop Simulations 1 to 13).

466. Under this revised design, a set of two side-by-side, single-circuit wood H-frame transmission structures will be sited alongside the existing CVPS 46 kV transmission line. In order to accommodate the double set of H-frame structures, a 335-foot right-of-way will be required for the two lines constituting the Newfane Loop and the 46 kV line and approximately 300 feet of clearing will be required. The H-frame structures for the Newfane Loop will be about 80 feet tall. Exh. Petitioners Supp. RR-1.

467. Although a significantly wider clearing and additional structures will be required to accommodate the two Newfane Loop circuits than in the original proposal for dual-circuit steel poles, the H-frame structures will be between 10 and 60 feet lower in height than the steel structures and 30 feet lower on average. Exh. Petitioners Supp. RR-1 at 3.

468. Under the revised design, the Newfane Loop will start from the Vernon-to-Cavendish 360 Line transmission line near structure 122 and will proceed west, down a steep hillside to the West River. There will be 16 new structures, east of the West River, including the take-off structure that will be in line with the 360 Line. The lines will then span from structures 129x-s and 129x-n, east of the river, to structures 130x-s and 130x-n at the top of the steep hillside west of River Road before entering the Newfane Substation. Exh. Petitioners MJB-2 at 114; exh. Petitioners Supp. RR-5.

469. The revised design for the Newfane Loop "is an optimal design based on aesthetics and cost." Exh. Stipulation 5 at 4-5.

470. Aesthetic and scenic impacts will include the additional clearing and the new H-frame structures in the landscape. Views of the Newfane Loop will primarily be available from locations along River Road, and particularly for 1,000 feet along the road, south of the corridor.

Short-duration views will also be available when traveling on Route 30, most notably in the vicinity of Newfane School. Although the cleared utility corridor and structures will not be widely visible except from River Road, River Road is a scenic rural road with undeveloped open space and "hill and dale" scenery. To help reduce the visual inconsistency of these impacts, landscape mitigation plans for the Newfane Loop include plantings along the western edge of River Road. Exh. Petitioners Supp. RR-5 at 5; exh. Petitioners MJB-2 at 114-118; exh. DPS-DR-1 at 24; tr. 11/6/08 at 168-9 (Raphael).

471. The Department's aesthetics consultant believes that views of the Newfane Loop may have the potential to shock and offend the average person, but acknowledged that it is a very close call. He also stated that he believes that the revised design for the Newfane Loop is probably the best alternative given the absence of other viable options and that VELCO has taken all reasonable and available mitigation measures. He concluded that the need for the construction of the Newfane Substation and Newfane Loop and the apparent absence of other more viable options, this might be a situation in which one has to accept and live with the aesthetic impacts. Exh. DPS-DR-1 at 24-25; tr. 11/6/08 at 157-159 (Raphael).

(I) Vermont Route 103, Cavendish

472. The existing line can be viewed from Route 103, most noticeably when approaching the crossing from the east; these views begin over one-half mile prior to the crossing. Views when approaching from the west are mostly screened by mature evergreen vegetation, except for views of the conductors crossing the roadway. Minor views of the tops of some structures are possible, but not easily seen. Minimal views from the recreational fields south of Route 103 are also possible, but are similar to views from the road, west of the crossing, and are isolated to the conductors and tops of the structures. Exh. Petitioners MJB-2 at 102.

473. With the addition of the second line, there will be a noticeable change to the visual character of the area. The majority of evergreen vegetation that currently screens views of structure 381 north of the road will be removed. This will open new views of existing and proposed infrastructure from the road. Views that already exist when approaching the crossing from the east will allow views of the Project upgrades. Exh. Petitioners MJB-2 at 102.

474. Because of driveway conflicts, Petitioners have made design revisions to proposed structure 381 that will shift its location by 20 feet and raise its height by 10 feet. This change will result in an increase in visibility of the structure. Exh. Petitioners Supp. RR-25 at 3.

475. Mitigation plantings are proposed to create new screening and help replace the loss of the existing evergreen vegetation. Exh. Petitioners MJB-2 at 102-103; exh. MJB-4 REV, Sheet L12.1.

476. The Town of Cavendish Selectboard has indicated to the Petitioners that it is satisfied with the proposed mitigation plans. Exh. Stipulation 5A at 3.

477. Petitioners and the Department will review the plans in the field and conduct field modifications as appropriate after the Project is constructed. Exh. Stipulation 5 at 6; exh. Stipulation 5A at 1.

(m) Coolidge Substation

478. The existing Coolidge Substation consists of a 6-acre fenced area located at the intersection of Quent Phelan Road, Barker Road and Nelson Road. The current substation is of substantial size and is a noticeable element in the existing landscape. Existing vegetation provides reasonable screening from many surrounding vantage points. Exh. Petitioners MJB-2 at 7-8.

479. The Coolidge Substation will be expanded to include a three-bay 345 kV substation with a breaker-and-one-half configuration, a six-position 115 kV ring bus, and four 115 kV capacitor banks. Exh. Petitioners MJB-2 at 7-8; *see also* exh. Petitioners Supp. RR-7 at 4-5.

480. In order to accommodate the expansion of the Coolidge Substation, the existing fence line will need to move towards Nelson Road to accommodate the new line. The grading will also need to be revised and much of the existing vegetative buffer between Nelson Road and the substation will be removed in response to the grading, and also because of proximity to new infrastructure. In addition, the new 345 kV line, when entering the substation from the south, will also result in a large portion of vegetation to be cleared that currently screens views of the substation. Exh. Petitioners MJB-2 at 118.

481. Accordingly, the expansion will increase in the visibility of the Coolidge Substation and will result in a change to the visual character of the area. Exh. Petitioners MJB-2 at 120.

482. The mitigation proposed by Petitioners includes a combination of landscape plantings and earth berms to remediate the new views created by the expansion of the substation. Petitioners also plan to underground an existing distribution line to accommodate the additional landscaping. Exh. Petitioners MJB-2 at 120; exh. Petitioners Supp. RR-25 at 5; exh. Petitioners MJB-4 REV, Sheet L12.2; tr. 11/6/08 at 141 (Buscher).

483. With the proposed mitigation measures, there will be no undue adverse impact resulting from Project upgrades at the Coolidge Substation. Exh. Petitioners MJB-2 at 91; exh. Stipulation 5 at 5; exh. Petitioners Supp. RR-25 at 5; tr. 11/6/08 at 156 (Raphael).

Discussion

In determining whether a proposed project would have an undue adverse effect on the aesthetics of an area, the Board has adopted the Environmental Board's analysis in Quechee Lakes Corporation, #3EW0411-EB and #3O439-EB (1986). We have previously summarized the Quechee analysis as follows:

In order to reach a determination as to whether the project will have an undue adverse effect on the aesthetics of the area, the Board employs the two-part test first outlined by the Vermont Environmental Board in Quechee, and further defined in numerous other decisions.

Pursuant to this procedure, first a determination must be made as to whether a project will have an adverse impact on aesthetics and the scenic and natural beauty. In order to find that it will have an adverse impact, a project must be out of character with its surroundings. Specific factors used in making this evaluation include the nature of the project's surroundings, the compatibility of the project's design with those surroundings, the suitability of the project's colors and materials with the immediate environment, the visibility of the project, and the impact of the project on open space.

The next step in the two-part test, once a conclusion as to the adverse effect of the project has been reached, is to determine whether the adverse effect of the project is "undue." The adverse effect is considered undue when a positive finding is reached regarding any one of the following factors:

1. Does the project violate a clear, written community standard intended to preserve the aesthetics or scenic beauty of the area?

2. Have the applicants failed to take generally available mitigating steps which a reasonable person would take to improve the harmony of the project with its surroundings?

3. Does the project offend the sensibilities of the average person? Is it offensive or shocking because it is out of character with its surroundings or significantly diminishes the scenic qualities of the area?²²

In addition to the Quechee analysis, the Board's consideration of aesthetics under Section 248 and our assessment of whether a particular project will have an undue adverse effect on aesthetics and scenic or natural beauty is "significantly informed by overall societal benefits of the project."²³

As we have found above, the Project is required to meet present and future demand for electric service, to address both local and regional reliability problems, and to comply with regional and national reliability standards. Nevertheless, a project of this magnitude, involving the construction of over 52 miles of new 345 kV transmission lines with over 400 new supporting structures averaging 79 feet in height, two new substations and the expansion of a third, cannot avoid, overall, having an adverse impact on the aesthetics and scenic beauty of an area.

While acknowledging the overall adverse aesthetic impact of such a major upgrade of the transmission infrastructure in Vermont, the record is, nonetheless, clear that the Petitioners have taken generally available steps to mitigate the impact of the Project and improve the harmony of the Project with its surroundings. In addition, the Project does not violate a clear written community standard intended to preserve aesthetics or scenic beauty in the Project area.

Reasonable mitigation measures have been developed and revised throughout the planning, design and review process on the initiative of the Petitioners and through collaborative discussions among the Petitioners, the Department, other parties, local officials and the public. The record indicates that the Petitioners have appropriately balanced the relevant cost, aesthetic and technical considerations. *See In re Vermont Electric Power Company*, 179 Vt. 370, 381, 895 A.2d 226 (2006). The record supports this conclusion both with respect to the Project, as whole,

22. *In re: Northwest Vt. Reliability Project*, Docket No. 6860, Order of 11/28/05 at 79-80.

23. *Id.* at 80; *In re: Northern Loop Project*, Docket No. 6792, Order of 7/17/03 at 28; *Petition of UPC Vermont Wind, LLC*, Docket No. 7156, Order of 8/8/07 at 65.

and with respect to specific elements of the Project, such as the Newfane Substation and Newfane Loop.

The most significant mitigation measure was to locate the 360 Line within the existing right-of-way for the 340 Line. In addition, the new Vernon Substation will be located near the existing transmission infrastructure and within the fence line of the Vermont Yankee power plant and the 360 Line will connect at the other end to an existing substation at Coolidge, which will be expanded to accommodate it. As such, new transmission infrastructure will be introduced into areas where existing transmission and distribution infrastructure has existed as part of the landscape for several decades. Despite the magnitude of the Project, its adverse impact has been significantly limited and contained by these mitigation measures.

Although the aesthetic and scenic impact of the Project is adverse as a whole, there is no evidence in the record that suggests an undue adverse effect at any location, except possibly in the viewshed of the Newfane Loop. In testimony at the technical hearing, Mr. Raphael, the Department's consultant on aesthetics, stated his belief that certain views of the Newfane Loop may have the potential to shock and offend the average person, although he acknowledged that it was a very close call. He also stated that he believes the revised design for the Newfane Loop is probably the best alternative given the absence of other viable options and that VELCO has taken all reasonable and available mitigation measures. He concluded that the need for the construction of the Newfane Substation and Newfane Loop and the apparent absence of other more viable options may create a situation in which we have to accept and live with the aesthetic impacts.²⁴

The aesthetic impact of a component of a project at a particular location must be viewed in the context of the entire project as a whole. As we have previously concluded, the impact of any component must be weighed in relation to the societal need for the project and the importance of the component to the success of the project.²⁵ This conclusion does not reduce in

24. Tr. 11/6/08 at 157-159 (Raphael). *See also* Exh. DPS-DR-1 at 24-25; Raphael reb. pf. at 1-2.

25. *See In re: Northwest Vt. Reliability Project*, Docket No. 6860, Order of 11/28/05 at 107: "even though we have found that VELCO's proposed substation expansion at the existing site would result in an undue adverse aesthetic impact, when weighed with the societal benefits of the Project, we would approve the substation expansion at the location of the existing substation, because it is integral to the success of the Project as a whole, if there were
(continued...)"

any way the obligation for the project sponsors, in the case of an adverse aesthetic impact at any particular location, to explore all other viable alternatives and to take all generally available mitigating steps to reduce the project's impact at that location. However, even with the best mitigation efforts, a transmission project of this magnitude could well create views at some locations that reasonable people may find visually shocking or offensive or violate community standards.

The Newfane Loop is not a stand-alone project, but is an integral part of the Project. In particular, it is required to connect the 360 Line to the Newfane Substation, which serves as the injection point into the CVPS subtransmission system. The choice for siting the substation at Newfane was undertaken as a deliberate mitigation measure to address the siting concerns associated with the previously considered Dummerston substation site and loop. The record indicates support for this siting change from the aesthetic experts, town officials and the public and an apparent consensus that the siting choice represents an improvement to the original Project design.

The significantly wider clearing and the new, large transmission structures required for the Newfane Loop create conditions that may be visually shocking. We nevertheless conclude that the adverse effects related to the Newfane Loop are not undue in light of (i) the societal need for the Project and its Newfane Loop and Newfane Substation components, which are integral to the success of the Project, as a whole, in improving the local reliability of electric service in southern Vermont, (ii) the apparent absence of any better site and design alternative, (iii) the conclusion of the Department and the Petitioners that the proposed design represents the optimal design based upon aesthetics and costs, and (iv) the extensive and good faith efforts of the Petitioners in considering alternative locations, designs and landscaping options throughout the process of planning for the proposed substation and loop so as to accommodate public opinion,

25. (...continued)
no viable alternatives."

balance competing concerns and mitigate the aesthetic and scenic impact of the needed substation and loop.²⁶

As part of the Memorandum of Understanding, the Petitioners and the Department reached understandings regarding landscaping plans to screen or otherwise mitigate the impact of the Project at various locations. Given the difficulty of fully and accurately assessing the adequacy of landscape mitigation measures prior to construction, the Department has reserved the right to make a post-construction review of these measures at eight sensitive locations and to request modifications at that time to landscape planting plans. The Petitioners and the Department have undertaken to work in good faith to reach agreement on the appropriate mitigation measures at these locations.²⁷ In view of the Board's responsibility to ensure that the petitioners take generally available mitigating steps to improve the harmony of the Project with its surroundings, the Board will require the Petitioners, as a condition of this Order, to make a filing with the Board for a determination as to the reasonable availability and relative efficacy of the mitigating steps related to landscape planting at these eight locations following the completion of any post-construction review by the Department.

Based upon the applicable law and the facts presented in this case and subject to the Petitioners' compliance with the condition set forth above, we conclude that the Project will not result in an undue adverse effect on aesthetics or on the scenic or natural beauty of the Project area.

(18) Rare and Irreplaceable Natural Areas [10 V.S.A. § 6086(a)(8)]

484. The Project will not have an undue adverse effect on any rare and irreplaceable natural areas. This finding is supported by findings 485 through 506, below.

485. There is no specific list of rare and irreplaceable natural areas protected by Act 250 Criterion 8. However, the list of State Natural Communities Areas (Thompson and Sorenson, 2000) and the database of "significant natural communities" maintained by the Non-game and

26. See Exh. Petitioners MJB-2 at 116; exh. Petitioners Supp. RR-25 at 5; exh. Petitioners MJB-4 REV, Sheet L5.1; tr. 11/6/08 at 158 (Raphael).

27. Exh. Stipulation 5 at 6.

Natural Heritage Program ("NNHP") were used as references to evaluate potential natural communities in the Project Study Area. Exh. Petitioners SD-2 at 37-38.

486. ANR identified five natural plant communities for which it recommended special protection or mitigation be undertaken to avoid undue adverse impacts resulting from the Project. These natural communities are located at: the West River Crossing at Williamsville Station; the West River Crossing at the Newfane Tap; the Grassy Brook Crossing at Grassy Brook Road in Brookline; the crossing of Wetland T-15 at Deer Valley Road in Townshend; and the crossing of Wetland CA-20 at the Black River in Cavendish. Sorenson reb. pf. at 1-2; Sorenson pf. at 3-5; exh. Stipulation at Appendix B, page 1.

487. The Petitioners and ANR have agreed upon a Southern Loop Natural Area Protection Plan to protect the five natural areas identified by ANR in order to avoid or mitigate impacts to those areas. Exh. Stipulation 1 at 4-5 and Appendix B, page 1.

488. The Petitioners and ANR agree that the measures set forth in the Natural Area Protection Plan address all outstanding concerns of ANR with respect to natural communities, and include all necessary conditions with respect to the Project's potential impacts under 30 V.S.A. § 248(b)(5). Exh. Stipulation 1 at 1.

489. For each natural area, the Petitioners have agreed to certain pre-construction, clearing, construction and maintenance measures to mitigate impacts associated with construction of the Project, as well as measures designed to compensate for unavoidable impacts to these natural areas. Exh. Stipulation 1 at Appendix B.

490. Prior to construction, the Petitioners have agreed to provide boundaries of each natural area on the Project plans and include special protection measures in Project-specific environmental training to contractors and mark the boundaries of each natural area using flagging and barrier tape. Exh. Stipulation 1, Appendix B, pages 1, 2, 3, 4, and 5.

491. As to clearing in all natural areas, work will be performed under the oversight of the Project Environmental Compliance Inspector(s), as identified in the Southern Loop Natural Area Protection Plan. Exh. Stipulation 1, Appendix B, pages 1, 2, 3, 4, 5, and 6.

492. At the West River Crossing at Williamsville Station, the Petitioners will demarcate nearby populations of rare threatened and endangered ("RTE") species with flagging/barrier tape. Exh. Stipulation 1 at Appendix B, page 1.

493. At Wetland CA-20, the Black River Crossing, the Petitioners will transplant rough avens (*Geum laciniatum*) populations to the western edge of the corridor in accordance with the Rare Plant Protection Plan. Exh. Stipulation 1 at Appendix B, page 5.

494. Clearing will be performed by hand utilizing the "drop and lop" method, with vegetation cut into smaller pieces and left in place at: (1) the West River Crossing at Williamsville Station, (2) the West River Crossing at the Newfane Tap, and (3) the Grassy Brook Crossing. No heavy equipment will be used within these natural areas. Exh. Stipulation 1 at Appendix B, pages 2, 3, and 4.

495. At the West River Crossing in Williamsville Station, VELCO will not broadcast wood chips into RTE plant areas or within the "seep area" (or groundwater discharge area) on the northern bank of the West River. Trees to be cut proximate to RTE species will be felled away from the plant areas. Exh. Stipulation 1 at Appendix B, page 2.

496. For Wetland T-15, the Simpsonville Swamp, VELCO will perform a delineation of sweet gale along the shoreline before the start of work and during the growing season in order to delineate the boundary of the natural area. Clearing will be performed as shown on Sheet NAPP-4 of the Natural Area Protection Plan and associated U.S. Army Core of Engineers and ANR permit authorizations, with no heavy equipment used in the flagged natural area. Wood chips will not be broadcast into the flagged area. VELCO will remove any temporary impacts, such as construction matting, within one week following clearing. Exh. Stipulation 1 at Appendix B, page 5.

497. At Wetland CA-20, the Black River Crossing, clearing will be performed in accordance with the provisions of the CUD, wood chips will be broadcast into the existing corridor to the fullest extent practicable, and VELCO will scatter tops of trees to the fullest extent practicable. Exh. Stipulation 1 at Appendix B, page 6.

498. During construction at the West River Crossing at Williamsville Station and the West River Crossing at the Newfane Tap, inspections will be conducted on foot. In those locations, as

well as the Grassy Brook Crossing, conductor stringing will be conducted by hand or aurally (e.g., shooting conductors across river, helicopter), if feasible. If such methods are not feasible, equipment may be used but shall be limited to all-terrain vehicle or low ground pressure equipment, with no heavy machinery to be used in flagged areas. Exh. Stipulation 1 at Appendix B, pages 2, 3, 4.

499. At Wetland T-15, construction, including conductor stringing and inspections, will be conducted on foot or from a boat for open water areas, with no tracked or wheeled motorized vehicles entering the wetland, other than the limited areas where tree clearing is necessary. Exh. Stipulation 1 at Appendix B, page 5.

500. At Wetland CA-20, equipment needed for construction will be limited to ATV (all terrain vehicle) or low ground pressure equipment, with no heavy equipment used in flagged areas. Exh. Stipulation 1 at Appendix B, page 6.

501. As to maintenance for all natural areas, VELCO has agreed that vegetation will be left to the maximum height possible in accordance with VELCO's Transmission Vegetation Management Plan and associated electrical reliability standards. VELCO will maintain vegetation in accordance with its 4-year cycle with hand cutting or targeted application of herbicides, unless this work is superseded by the development of the "Best Management Practices for Vegetative Maintenance." Exh. Stipulation 1 at Appendix B pages 2, 3, 4, 5, 6.

502. In addition, at Wetland T-15, VELCO will control non-native invasive shrubs, honeysuckle and others, in the flagged natural area and adjacent upland 50-foot buffer zone with targeted application of herbicide, contingent upon landowner approval, or other methods agreed to by VELCO, ANR and the landowner. Exh. Stipulation 1 at Appendix B, page 5.

503. The Project will result in the impacts to approximately two acres of forested floodplain natural communities, resulting in a four-acre mitigation requirement. To satisfy this mitigation requirement, VELCO will: (1) include the conservation of suitable areas of forested floodplain in the Project wetland mitigation effort; (2) conserve suitable areas of forested floodplain on existing VELCO property; and/or (3) acquire and/or conserve suitable areas of forested floodplain, preferably on the West River. Mitigation efforts will be completed within one year

following completion of construction or before May 2011, whichever is later. Exh. Stipulation 1 at Appendix B, page 7.

504. The Petitioners are developing a comprehensive management plan together with ANR. The Petitioners and ANR, along with other stakeholders, will work collaboratively to develop a uniform set of BMPs for integrated vegetation management of electric utility corridors, including the use of selective herbicides. Exh. Stipulation 1 at 5.

505. The Petitioners and ANR have agreed to use their best efforts to assist the collaborative to establish a consensus set of BMPs by June, 2009. The Petitioners and ANR agree that no specific restrictions as to herbicide use associated with the Project shall be proposed or implemented, except as determined by an agreement among the collaborative or as otherwise already set forth in VELCO's Transmission Vegetation Management Plan. Exh. Stipulation 1 at 5.

506. The use of herbicides is included in VELCO's Transmission Vegetation Management Plan. A Permit to Conduct Rights of Way Herbicide Treatment is required annually from the Agency of Agriculture. The herbicide treatment permit applications are reviewed annually by the Vermont Pesticide Advisory Council, which includes representatives from ANR. Disorda pf. at 16; exh. Petitioners JD-8.

(19) Necessary Wildlife Habitat & Endangered Species [10 V.S.A. § 6086(a)(8)(A)]

507. The Project will not have an undue, adverse impact on any necessary wildlife habitat or any endangered species. This finding is supported by findings 508 through 522, below.

Wildlife Habitat

508. The Project may impact fourteen deer wintering areas, totaling approximately 110 acres, as a result of clearing associated with the Project. Exh. Petitioners SD-2 at 48; exh. Stipulation 1 at 3.

509. Within two years of the issuance of the CPG, the Petitioners agree to implement the deer mitigation effort that will include the conservation of additional land for deer wintering areas, in accordance with the 2/1 and 4/1 mitigation ratios set forth in the ANR's Deer Mitigation

Guidelines. For every one acre impacted, the mitigation ratios provide for the protection of two on-site acres within the same deer wintering area or four off-site acres outside of the impacted deer wintering area . The mitigation ratios are designed to yield the proportion of deer winter range necessary to maintain state deer population goals. Exh. Stipulation 1 at 3; exh. ANR FH-2.

510. The deer mitigation will include: (1) conservation of between 220 to 440 additional acres of habitat on land already owned by VELCO, with final amounts to be mutually agreed upon by the parties; and (2) development of wildlife crossing areas through vegetation management techniques designed to favor vegetation that can support snow (softwoods) and thereby keep the snow depth on the ground shallow enough for deer to move through the travel lanes, which crossings will be mapped by Petitioners. Exh. Stipulation 1 at 3.

511. The Petitioners have provided ANR with specific acreage calculations and plans. The specific practices to be employed in the wildlife crossings will include: (1) selective removal of trees favoring crown closure, or canopy cover; (2) removing cut material or cutting up the material in small enough pieces so as not to interfere with animal movement in the travel lane; (3) promoting compatible species of trees and shrubs; and (4) favoring continued growth and reproduction of coniferous vegetation with canopies that intercept snow. Exh. Stipulation 1 at 3.

512. The Project area traverses a comparatively remote and extensive mixed-aged forest on both sides of the existing 340 Line. The existing right-of-way has a diverse array of desirable shrubbery and herbaceous vegetation cover and food species for avian, vertebrate and mammal species. The Project will increase the existing habitat and provide preferable cover, food sources, or browse for deer, bears, and bird wildlife species. Exh. Petitioners SD-2 at 45-46.

513. The Project right-of-way does not cross any known black bear breeding-ground sites, and the proposed clearing of an approximately 100-foot forested right-of-way will not destroy or significantly imperil necessary black bear habitat. Exh. Petitioners SD-2 at 49.

Threatened and Endangered Species

514. Only one animal species listed as threatened or endangered has been identified that may potentially be impacted by the Project, the Eastern racer (*Coluber constrictor*) snake, a species of snake listed as "threatened" in Vermont. Exh. Petitioners SD-2 at 37; exh. Stipulation 1 at 3.

515. There have been no sightings of the Eastern racer in the Project corridor or substation sites, although this species has previously been sighted in southern Vermont. Exh. Petitioners SD-2 at 37; exh. Stipulation 1 at 3.

516. Based on a developed protocol for surveying the Project corridor for the Eastern racer, the Petitioners have completed a survey of the corridor, and no Eastern racer were found. In addition, the Parties have worked collaboratively to develop a mitigation plan to reduce the risk of impacting the Eastern racer snake, should the species be discovered during construction. Exh. Stipulation 1 at 3-4; see TRC Black Racer Survey Report, May 2008.

517. Populations of two endangered plant species, the Barbed-bristle bulrush (*Scirpus ancistrochaetus*) and Greene's rush (*Juncus greenei*), and one threatened species, the Three-bird orchid (*Triphora trianthophora*), have been identified in or near the Project area. Exh. Petitioners SD-2 at 34-35; exh. Stipulation 1 at 4.

518. There are a total of four areas along the Project corridor that have been identified as potential habitat for the Barbed-bristle bulrush and have been surveyed during the appropriate period, with no Barbed-bristle bulrush found. The Petitioners have developed a Protection Plan for the Barbed-bristle bulrush and ANR and the Petitioners agree that the avoidance and mitigation measures contained therein are reasonable and sufficient and preclude the need for a takings permit. Exh. Stipulation 1 at 4 and Appendix A.

519. Impacts to Greene's rush will be avoided as a result of use of alternate construction access routes and construction activity sites. In addition, the Petitioners will employ protective measures for avoiding Greene's rush, including locating occurrences of the species on project plans, signage, installation of barriers surrounding the area of occurrence, environmental training for contractors, compliance monitoring and oversight, and close coordination with contractors. Exh. Stipulation 1 at 4.

520. A cluster of the Three-bird orchid was identified at the edge of, but within the proposed area of clearing for, the new Project corridor. ANR and the Petitioners are working collaboratively to develop a mitigation plan for this species. Exh. Stipulation 1 at 4.

521. The Petitioners and ANR have identified eight rare and uncommon plant species along the Project corridor as to which Petitioners have agreed to apply special conditions in order to

avoid or mitigate impacts. These locations and protection measures are set forth in the Southern Loop Rare Plant Protection Plan. The Plan includes avoidance and mitigation measures for the pre-construction, construction, and post-construction periods. Exh. Petitioners SD-2 at 35-36; exh. Stipulation 1 at 5 and Appendix C; Damiano/Connaughton/Stamatov reb. pf. at 7-9.

522. No specific mitigation, avoidance, monitoring or other restrictions shall apply to rare or uncommon plant species in connection with the Project, except as set forth in the Rare Plant Protection Plan. Exh. Stipulation 1 at 5.

(20) Historic Sites [10 V.S.A. § 6086(a)(8)]

523. The proposed Project will not have an undue adverse effect on historic resources. This finding is supported by findings 524 through 534, below.

(a) Archaeological Resources

524. The Louis Berger Group, Inc. ("Berger") prepared an Archaeological Resource Assessment ("ARA") and Scope of Work ("SOW") for VELCO. The purpose of the ARA was to identify sites within the area of the Project considered to have a high potential for archaeological deposits, while the SOW developed an approach to address these sensitive archaeological areas within the Project area. Luhman pf. at 2-3; exh. Petitioners HL-1 at 1 and 164.

525. Berger identified 5.2 percent of the Project area as "sensitive" and a total of 53 areas of potential archaeological sensitivity in the right-of-way and along proposed access roads. These areas were identified through background research, including a review of information about known archaeological sites maintained at the office of the Agency of Commerce and Community Development Division for Historic Preservation ("DHP"), as well as through a field inspection of the right-of-way to identify sensitive landforms for purposes of further archaeological testing. Berger used the DHP's Guidelines and an Environmental Predictive Model for Locating Precontact Archaeological Sites in conducting its field survey and also reviewed several qualitative factors to make recommendations for additional testing. Berger also relied on previous work completed by the Consulting Archaeology Program at the University of Vermont, and Berger's own research and experience. Luhman pf. at 3; exh. Petitioners HL-1; Luhman/Gould/Rinehart reb. pf. at 6-9, 13-15, 19, 38.

526. Following completion of the ARA, Berger proposed to undertake additional field investigations involving both surface inspections and subsurface surveys in sensitive areas in accordance with DHP guidelines. Any deep excavations will be conducted in a manner consistent with the trenching and shoring regulations of the Occupational Safety and Health Administration. If archaeological sites are identified during an initial subsurface survey, a determination will be made as to whether the sites may be avoided. Where avoidance is not possible, additional investigation will be completed at the site-examination level to ascertain site boundaries with respect to the proposed activities. If the consultants then determine that the archaeological site is eligible for the National Register and that project-related impacts will occur, a plan will be prepared to guide any data recovery excavations that may be necessary. Luhman pf. at 4- 6.

527. If the recommendations of Berger are followed in the archaeologically sensitive areas identified by Berger, the Project will not have an undue adverse effect on archaeological historic sites. Luhman pf. at 7; Luhman/Gould/Rinehart reb. pf. at 4.

528. The DHP was initially a party in this proceeding and prefiled testimony, but withdrew from participation in this proceeding before the technical hearings and did not introduce any testimony into the record. In its withdrawal notice, DHP indicated that it would continue in its consultation role with the U.S. Army Corps of Engineers under Section 106 of the National Historic Preservation Act and that it anticipates working collaboratively with VELCO to resolve the archeology requirements related to the Project. DHP Notice of Withdrawal from Docket No. 7373, October 6, 2008.

529. The Advisory Council on Historic Preservation ("Council") did not enter an appearance in this proceeding, nor has any party brought to the attention of the Board any testimony presented by the Council related to the Project area in other proceedings.

Discussion

Under 30 V.S.A. § 248(b)(5), the Board is required to determine whether a proposed facility will "have an undue adverse effect on . . . historic sites," with the Board giving "due

consideration" to certain specified criterion under 10 V.S.A. § 6001 et seq., including criterion 8 relating to historic sites. 10 V.S.A. § 6086(a)(8).

Based on the testimony of representatives of Berger, the ARA and the SOW, we conclude that the Project will not have an undue adverse effect on archaeological historic sites for purposes of 30 V.S.A. § 248(b)(5) and 10 V.S.A. § 6086(a)(8), subject to and on the condition that the related work is performed as provided in the testimony, ARA and SOW, and followed-up with the recommended evaluation and mitigation steps, if required, in the archeologically sensitive areas identified by Berger.

The results of Berger's post-ARA survey had not been introduced into evidence, and the Board does not yet have a basis for concluding that the above condition has been satisfied and that all recommended evaluation and mitigation steps in the sensitive areas have or will be taken. Therefore, as part of the post-certification process, the Petitioners shall file with the Board and provide parties to this docket with a document summarizing the results of the post-ARA field work, and providing any recommendations for mitigation, or confirming that any newly-identified historic sites can be avoided. Such filing may take the form of a copy of the End of Field Letter being delivered to the the U.S. Army Corps of Engineers pursuant to 36 C.F.R. § 800.1 et seq., to the extent such End of Field Letter suffices to meet this requirement. After the filing of such document, the Board, on its own initiative or upon the motion of a party, may require additional proceedings to ensure compliance with the above condition of this Order.

(b) Above-Ground Historic Resources

530. The Petitioners and DHP identified a total of 86 historic properties located in areas potentially affected by the Project. Eleven of these properties were previously listed in the Vermont State Register, and 75 are considered eligible for listing in the National Register of Historic Places. Luhman/Ciuffo/Buscher pf. at 8; exh. Petitioners Rebuttal LCB-1 at 3, 38.

531. Of these 86 properties, there are 26 properties potentially eligible for the National Register of Historic Places that will have visibility to the 360 Line. In the case of nine of these properties, the transmission line is visible with an adverse effect within a property's significant viewshed. Two of these properties are located in Guilford, five in Vernon, one in Brattleboro

and one in Cavendish. Luhman/Ciuffo/Buscher pf. at 9-10; exh. Petitioners LCB-3 at 171, 191; exh. Petitioners Rebuttal LCB-1 at 3, 38.

532. Mitigating steps have been undertaken in the design of the 360 Line by the use of structures with a configuration and height similar to the existing 340 Line and by locating new structures adjacent to existing structures if feasible. VELCO also plans to install landscape mitigation plantings along the corridor to screen views of the existing and proposed structures. Exh. Petitioners LCB-3 at 171, 191; exh. Petitioners Rebuttal LCB-1 at 38.

533. The presence of an existing transmission line (the 340 Line) within the viewshed of the affected properties will generally reduce the impact of the 360 Line within this viewshed. Exh. Petitioners LCB-3 at 171, 191; exh. Petitioners Rebuttal LCB-1 at 3.

534. The Project does not interfere with the general public's ability to interpret and appreciate the historic qualities of the 86 properties evaluated. The cumulative effects on the historic qualities of the properties by various Project components do not create an unacceptable effect, and the Project does not violate a clear written community standard intended to preserve historic qualities of a site. Exh. Petitioners LCB-3 at 171; exh. Petitioners Reb. LCB-1 at 3.

Discussion

We evaluate above-ground historic sites in the Project area under the same legal standard as archaeological resources. The Petitioners, based on their own investigation and the subsequent recommendations of the Vermont Division for Historic Preservation, engaged in a viewshed analysis of 86 above-ground historic properties, nine of which will be adversely affected by the Project. Based on the findings above, however, none of the impacts to these properties will be unduly adverse.

(21) Development Affecting Public Investments [10 V.S.A. § 6086(a)(9)(K)]

535. The Project will not materially jeopardize or interfere with the function, efficiency, safety, or the public's use of, access to, or enjoyment of public resources, facilities, services, or lands. This finding is supported by findings 536 through 539, below.

536. The new Vernon-to-Cavendish 345 kV line will span across several highways and public roads, including interstate 89 in Vernon. No pole structures will be constructed within road rights-of-way. Stamatov pf. at 16.

537. The Project transmission lines will also span several rivers. Petitioners will undertake appropriate construction and EPSC measures to protect these resources, including measures outlined in the Transmission Vegetation Management Plan. Exh. Petitioners SD-2 (Natural Resource Assessment Report) at 14, 17.

538. Based on title research of adjoining property owners, no other potentially-affected public lands were identified. Stamatov pf. at 16.

539. Failure to upgrade the transmission facilities as they presently exist, given the reliability risks, poses a threat to public investments. Stamatov pf. at 16.

(22) Least-Cost Integrated Resource Plan [30 V.S.A. § 248(b)(6)]

540. Although VELCO has not been required to have an integrated resource plan, it is required to plan its transmission system in accordance with the Memorandum of Understanding that the Board approved in Docket No. 7081 in its Order of June 20, 2007. The Docket No. 7081 Memorandum of Understanding sets forth a process that facilitates least-cost integrated resource planning for Vermont's transmission system. Lamont pf. at 12; *see*, Investigation into Least-Cost Integrated Resource Planning for Vermont Electric Power Company, Inc.'s Transmission System, Docket No. 7081, Order of 6/20/07 at 3.

541. The Project was identified in VELCO's 2006 Long-Range Transmission Plan Analysis as addressing the most significant problem on the system. As a result, VELCO and the other signatories to the Docket No. 7081 Memorandum of Understanding included the Southern Loop Project as part of the transition plan set forth in the Memorandum of Understanding. LaForest pf. at 14.

542. The proposed Project is consistent with the principles of integrated least-cost planning, including consideration of the environmental impacts of resource alternatives. Findings in Section IIE, above; Lamont pf. at 3, 12; Smith pf. at 20.

543. The Project is consistent with the principles for resource selection expressed in CVPS's Integrated Resource Plan ("IRP"). Jones/Kirby pf. at 27.

544. CVPS strives to improve reliability and efficiency as outlined in its IRP. *Id.*; *see also* exh. Petitioners KJ/LK-4.

545. The Project elements designed to solve the local reliability problem had the lowest twenty-year New England societal costs of the solution options providing full effectiveness for the five root problems assessed by CVPS. These Project elements also had the lowest Vermont customer societal cost. Jones/Kirby reb. pf. at 6.

546. Growing electric demand in the CVPS target area has been addressed by two principal means: (a) the installation of switched shunt capacitors along the loop to prop up its voltage; and (b) the use of DSM to ease the burden on the system. Jones/Kirby pf. at 8.

547. Additionally, a second 115/46 kV transformer was added at the Woodford Road Substation in Bennington in 1995 in order to provide redundancy and to share the demand with the original transformer, which was becoming vulnerable to overload for some contingencies. *Id.*

548. The two main strategies for managing demand growth in the CVPS target area have run their course and are now becoming ineffective at managing further growth solely by themselves. *Id.*

Discussion

Section 248(b)(6) provides that, before issuing a certificate of public good for a company's proposed purchase, investment, or construction, the Board must find that the proposed action "is consistent with the principles for resource selection expressed in that company's approved least cost integrated plan."²⁸

Of the two Petitioners, only CVPS has an approved least-cost integrated resource plan. The proposed Project is consistent with CVPS's plan.

28. A separate statutory section — 30 V.S.A. § 218c — requires that "[e]ach regulated electric or gas company shall prepare and implement a least cost integrated plan for the provision of energy services to its Vermont customers." Section 218c further provides that the utility shall submit its proposed least-cost integrated plan to the Board, which may approve the plan if it complies with the least-cost planning requirements detailed elsewhere in the section.

VELCO has not been required by the Board to develop an IRP. However, in 2005, 30 V.S.A. § 218c(d) was passed into law as part of Act 61. Section 218c(d) includes requirements for a transmission-owning utility such as VELCO, which does not have a retail service territory, to prepare a transmission-system plan jointly with other electric companies that own or operate these facilities, after public hearings and opportunity for input by the distribution utilities, the state's Energy Efficiency Utility, the Department, and other entities. Section 218c(d) states that "[t]he objective of the plan shall be to identify the potential need for transmission system improvements as soon as possible, in order to allow sufficient time to plan and implement more cost-effective nontransmission alternatives to meet the reliability needs, wherever feasible." Act 61 also requires the distribution utilities to incorporate the transmission system plan into their own integrated resource plans. The Docket No. 7081 Memorandum of Understanding, approved by the Board in June of 2007, sets forth a process to facilitate the planning process and objectives identified in Section 218c(d).

Furthermore, when the legislature amended Section 248 to add criterion (b)(6), it expressly provided that the statute as amended:

does not prohibit the public service board from granting a certificate of public good under 10 V.S.A. § 248 for a utility which does not have an approved least cost integrated plan; provided that the board shall consider in its review under that section those environmental effects which the utility must consider in developing a least cost integrated plan.²⁹

Consistent with this legislative intent, when utilities do not have approved integrated resource plans, the Board evaluates projects under Section 248(b)(6) according to their consistency with the principles of least-cost integrated planning.³⁰ Those principles include consideration of the environmental impacts of the utility's resource decisions.³¹

As the findings in Section IIE demonstrate, potential alternatives to the Project have been extensively analyzed according to the principles of least-cost planning. This analysis has shown that there are no viable or cost-effective non-transmission alternatives to the Project.

29. P.A. No. 259, § 8 (1992 Vt., Adj. Sess.).

30. Docket No. 5737, *Petition of Citizens Utilities Company re Baldwin Hydroelectric Project*, Order of 4/17/95 at 16–17.

31. See 30 V.S.A. § 218c(a)(1).

We thus conclude that the proposed Project satisfies Section 248(b)(6).

(23) Compliance with Electric Energy Plan [30 V.S.A. § 248(b)(7)]

549. The Project complies with the Electric Energy Plan approved by the Department under 30 V.S.A. § 202. This finding is supported by findings 550 through 554, below.

550. The Project meets the intent of the Department's 2005 Electric Energy Plan (the "Plan"), particularly in that it improves reliability to an appropriate level. Tr. 10/28/08 at 25-26 (Lamont).

551. The Plan describes the following overarching policy objectives:

Modern society has come to depend on reliable electricity as an essential resource for national security, health and welfare, communications, finance, transportation, food and water supply, heating, cooling, lighting; computers and electronics; commercial enterprise; and even entertainment and leisure. In short, nearly all aspects of modern life are driven by electricity. Customers have grown to expect that electricity will almost always be available when needed at the flick of a switch. Most customers have also experienced local outages What is not expected is the occurrence of a massive outage on a calm, warm day. Widespread electrical outages, such as the one that occurred on August 14, 2003, are rare, but they can happen if multiple reliability safeguards break down. Such outages, in turn, produce considerable economic losses.

LaForest/Diebold pf. at 57 (quoting the Plan at page 7-1).

552. The Plan states:

Drawing from the State Energy Policy, the Plan establishes as a benchmark that, ". . . to the greatest extent practicable, . . . Vermont can meet its energy service needs in a manner that is adequate, reliable, secure and sustainable; that assures affordability and encourages the state's economic vitality, the efficient use of energy resources and cost effective demand side management; and that is environmentally sound

Id. at 58 (quoting the Plan at page 1-5).

553. With respect to adequate and reliable service, the Plan recognizes the importance of an adequate and reliable transmission and distribution infrastructure as a means of handling peak demand:

To meet peak demands . . . not only must utilities secure sufficient electric supplies to meet peak demands, they must be able to distribute them to customers over the network of transmission and distribution lines that cross the state. Therefore, Vermont's poles and wires network must be large enough to handle all of the electricity demanded.

Id. at 58 (quoting the Plan at page 3-6).

554. The proposed Project is consistent with the goals of the Plan that are described in the previous three findings. *Id.* at 58– 60; *see* findings in Sections IIE, IIG, and IIH, above.

Discussion

Section 248(b)(7) requires that, in order to issue a certificate of public good, we find that the proposed Project is "is in compliance with the electric energy plan approved by the department under section 202 of this title, or that there exists good cause to permit the proposed action."³² We conclude that the proposed Project is in compliance with the Plan. This conclusion is based upon the foregoing findings of fact, including those referenced from other relevant sections of this Order. As noted by this Board in its Order approving the Northwest Vermont Reliability Project, "the overriding goals in the . . . Plan 'to meet Vermont's electric needs in a manner that is efficient, adequate, reliable, secure, sustainable, affordable, safe and environmentally sound,' reflect the very factors that we evaluate under the various provisions of Section 248(b)."³³ We further conclude that, because the Project is required to meet a present and future need for reliable electric service, and is the most cost-effective option for doing so, even if the Project were determined not to be in compliance with the Plan, there would be ample good cause to approve it.

(24) Outstanding Resource Waters [30 V.S.A. § 248(b)(8)]

555. The Project will not affect any segment of any outstanding resource waters of the State as identified by the Vermont Water Resources Board. Exh. Petitioners SD-2 at 6.

(25) Existing Transmission Facilities [30 V.S.A. § 248(b)(10)]

556. The proposed Project can be served economically by existing or planned transmission facilities without undue adverse effect on Vermont utilities or customers. This finding is supported by findings 557 and 558, below.

32. 30 V.S.A. § 248(b)(7).

33. In re: Northwest Vermont Reliability Project, Docket No. 6860, Order of 1/28/05 at 210, fn. 211.

557. The existing transmission and subtransmission network serving the region and southern Vermont is not capable of reliably meeting Vermont's existing and future electrical needs. *See* Findings 112 through 173, above.

558. The primary purpose of the proposed Project is to improve the reliability and adequacy of the existing transmission facilities serving Vermont. *See* Findings 174 through 183, above.

III. CONCERNS OF THE PUBLIC

The Board has received dozens of comments upon the proposed Project in the form of oral comments at the public hearing, written comments, and e-mails. Under Vermont law, our decision must be based upon the evidence presented by formal parties during the evidentiary hearings. However, public comments play an important role by raising new issues or offering perspectives that we should consider. Although it is not possible to address each individual concern, the comments generally fall into the following six categories:

- **Aesthetics:** Commenters were concerned with the aesthetic impact of the proposed Project, and the potential that these impacts could result in decreased tourism and property values.
- **Environmental Impacts:** Several people expressed concerns about environmental impacts associated with construction of the proposed Project.
- **Electromagnetic fields:** Some commenters questioned whether EMF levels from the proposed Project would result in a health risk.
- **Alternatives to the proposed Project:** A number of people suggested that increased energy efficiency, distributed generation, and smart-grid technology could obviate the need for the proposed Project, and that the Project should be delayed so that such alternatives could be further explored.
- **Beneficiaries of the proposed Project:** The Board received a number of comments questioning whether the proposed Project is truly needed to serve Vermont, or whether instead is being constructed only for the benefit of other states or of VELCO's owners.
- **Support for the proposed Project:** Some commenters recommended that the Board approve the proposed Project for the increased electric reliability and attendant economic benefit.

Although the comments cannot directly form the basis of our decision, they have helped us in identifying and focusing on the issues that directly impact the lives of Vermont citizens.

We have addressed these issues in other sections of this Order. For the reasons stated in those sections, we have concluded that while the proposed Project will result in some adverse impacts, it represents the best solution to pressing and significant reliability problems in the Vermont bulk power system, and thus will promote the public good.

IV. CONCLUSION

For the reasons set forth above, we conclude that the proposed Project will promote the general good of the state, and is approved, with the conditions included in the attached Order and Certificate of Public Good.

V. ORDER

IT IS HEREBY ORDERED, ADJUDGED AND DECREED by the Public Service Board of the State of Vermont that the proposed Project, in accordance with the evidence and plans submitted in this proceeding, and as modified and conditioned by this Order, will promote the public good of the State of Vermont in accordance with 30 V.S.A. § 248, and a certificate of public good to that effect shall be issued with the conditions set forth below.

1. Prior to proceeding with construction, Petitioners shall file, for the Board's approval, final construction plans for the proposed upgrades, which Project plans shall conform substantially to the Project plans approved in today's Order. Petitioners shall note any changes in the final plans from the plans approved by the Order and any affected party shall have two weeks to comment on any such changes from the date the plans are filed. The Petitioners may commence construction only after receiving Board approval for such plans.

2. Construction, operation and maintenance of the proposed Project shall be in accordance with the findings and requirements set forth in the Order.

3. Prior to proceeding with construction, the Petitioners shall obtain all necessary permits and approvals. Construction, operation, and maintenance of the proposed Project shall be in accordance with such permits and approvals, and with all other applicable regulations, including those of the Vermont Agency of Natural Resources and the U.S. Army Corps of Engineers.

4. The Project shall comply with the practices and standards outlined in VELCO's Stream Crossing Plan, Transmission Vegetation Management Plan, Environmental Guidance Manual and a project-specific Erosion Prevention and Sediment Control ("EPSC") plan.

5. The Petitioners shall file with the Board and provide parties to this docket with a document summarizing the results of the post-ARA field work, and providing any recommendations for mitigation, or confirming that any newly-identified historic sites can be avoided. Such filing may take the form of a copy of the End of Field Letter being delivered to the U.S. Army Corps of Engineers pursuant to 36 C.F.R. § 800.1 et seq., to the extent such End of Field Letter suffices to meet this requirement. After the filing of such document, the Board, on its own initiative or upon the motion of a party, may require additional proceedings to ensure compliance with the above condition of this Order.

6. The Petitioners shall comply with all conditions and requirements set forth in the following agreements:

(a) Memorandum of Understanding dated September 2, 2008, among the Petitioners and the Vermont Agency of Natural Resources with associated attachments; and

(b) Memorandum of Understanding dated October 13, 2008, among the Petitioners and the Vermont Department of Public Service, as supplemented by the Memorandum from Michael Buscher to David Raphael dated October 23, 2008 (revised 10/28/08).

7. Upon the completion of the Department's post-construction review of the effectiveness of any proposed or modified landscape planting at the Vernon Substation and the seven locations identified in numbered paragraph 10 of the Memorandum of Understanding between the Petitioners and the Department (Exh. Stipulation-5), the Petitioners shall make a filing with the Board for a determination as to the reasonable availability and relative efficacy of the landscaping measures in mitigating the visual impact of the Project at these locations.

8. The Board retains jurisdiction to review aesthetic mitigation measures post-construction and to require additional mitigation measures as the Board determines to be appropriate.

9. At all Project substations, new power transformers shall comply with sound emissions at least 10 dBA below National Electrical Manufacturer's Association TR-1 standards. Low-corona busbars and other hardware on the 345 kV yards shall be used to minimize corona noise.

Petitioners shall conduct pre- and post-construction noise monitoring at all Project substations to confirm that the transformers are operating according to their specifications and file the results with the Board and affected parties. The Board shall retain jurisdiction to decide any issues associated with post-construction noise at the Project substations.

10. For the Project transmission lines, the Petitioners shall employ low-corona type insulators and similar equipment, and shall avoid the use of equipment that leads to corona noise such as angular metals.

11. Petitioners shall identify areas of high EMF levels close to existing residences and propose low-cost measures likely to mitigate EMF exposure at these locations. Petitioners shall file a report addressing EMF mitigation with the Board and parties within 90 days of the issuance of a certificate of public good in this Docket. The Board shall retain jurisdiction to require further changes in the design of the involved portion or portions of the Project, if necessary.

12. Petitioners shall file quarterly statements of their latest cost estimates, as well as prompt notification if estimated overall Project costs increase by more than five percent compared to the most recent filed cost estimate.

13. Within sixty days of the date of this Order, VELCO shall file a letter clarifying whether it is a partner in EPA's SF6 Emission Reduction Partnership for Electric Power Systems.

14. The Certificate of Public Good shall not be transferred without prior approval of the Board.

Dated at Montpelier, Vermont, this 11th day of February, 2009.

<u>s/ James Volz</u>)	PUBLIC SERVICE
)	
)	BOARD
<u>s/ David C. Coen</u>)	
)	OF VERMONT
)	
<u>s/ John D. Burke</u>)	

OFFICE OF THE CLERK

FILED: February 11, 2009

ATTEST: s/ Susan M. Hudson
Clerk of the Board

NOTICE TO READERS: This decision is subject to revision of technical errors. Readers are requested to notify the Clerk of the Board (by e-mail, telephone, or in writing) of any apparent errors, in order that any necessary corrections may be made. (E-mail address: psb.clerk@state.vt.us)

Appeal of this decision to the Supreme Court of Vermont must be filed with the Clerk of the Board within thirty days. Appeal will not stay the effect of this Order, absent further Order by this Board or appropriate action by the Supreme Court of Vermont. Motions for reconsideration or stay, if any, must be filed with the Clerk of the Board within ten days of the date of this decision and order.